The NATIONAL GEOGRAPHIC MAGAZINE

Vol. XXI JANUARY, 1910 No. 1

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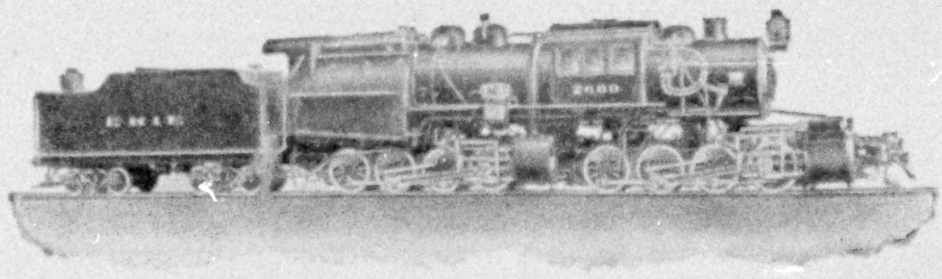

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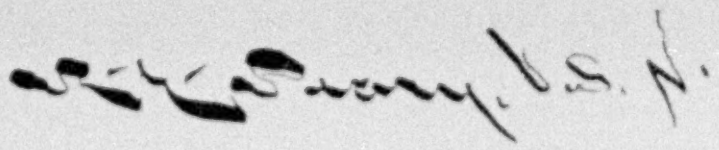

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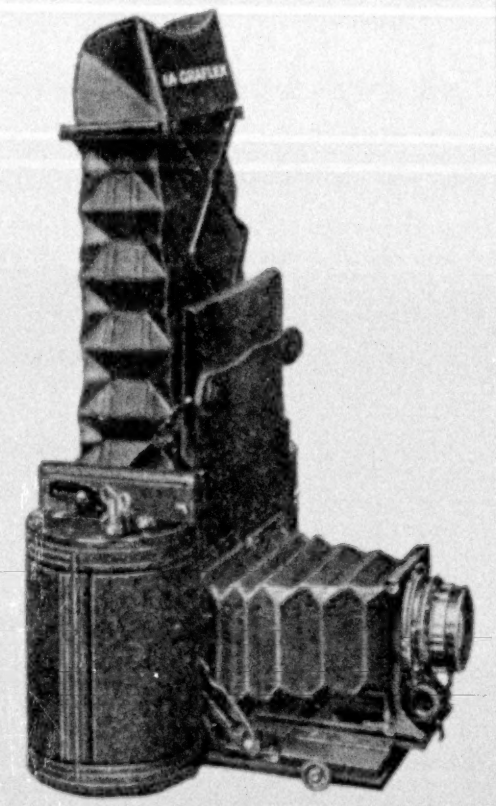

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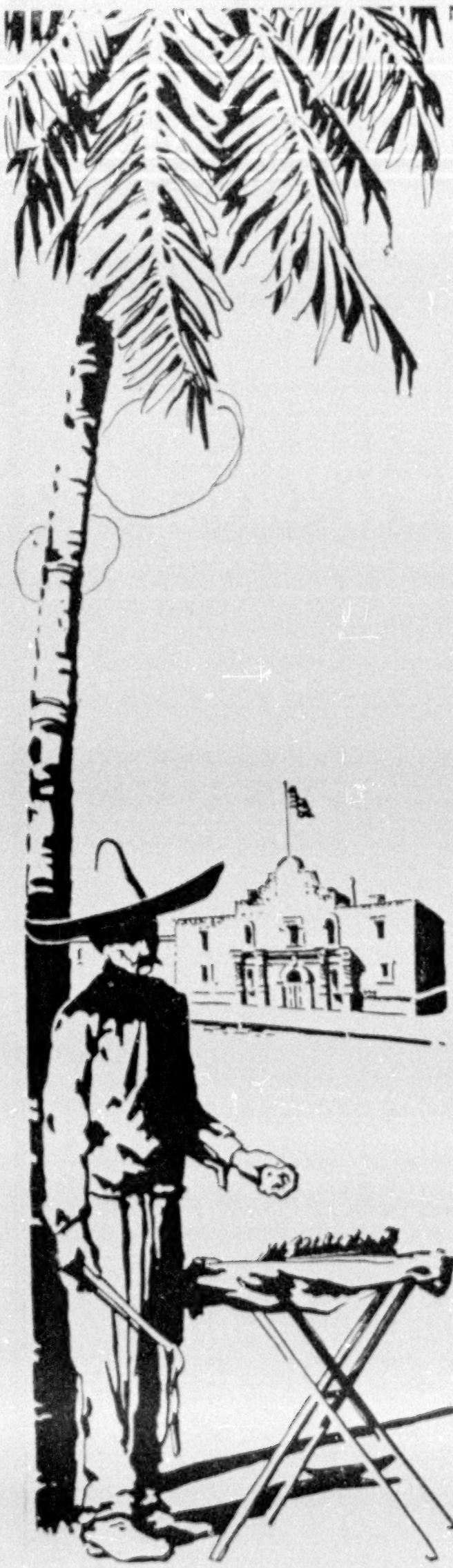

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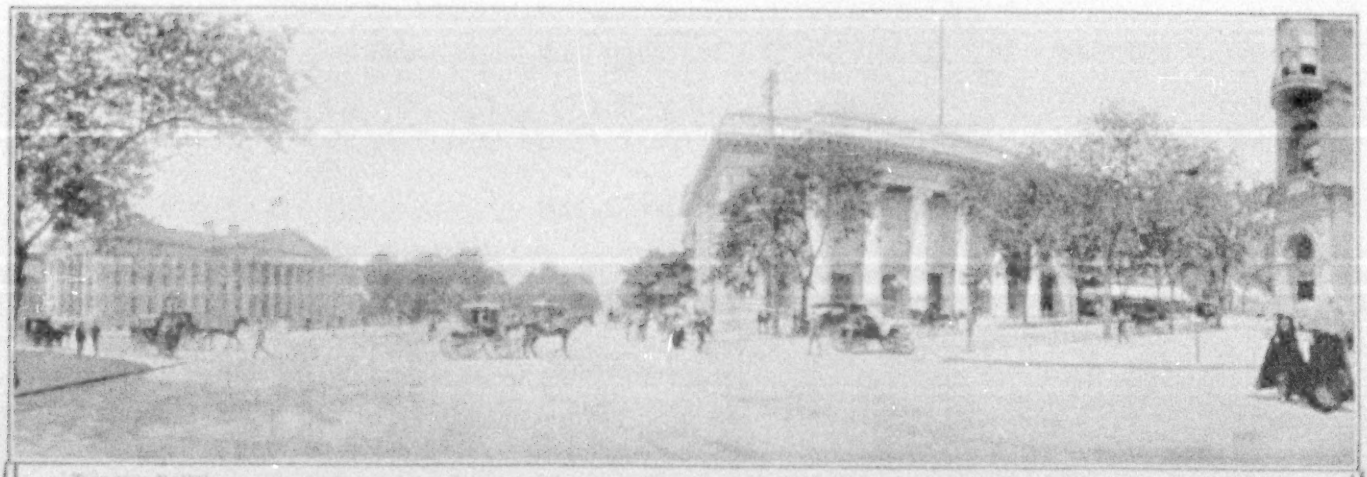

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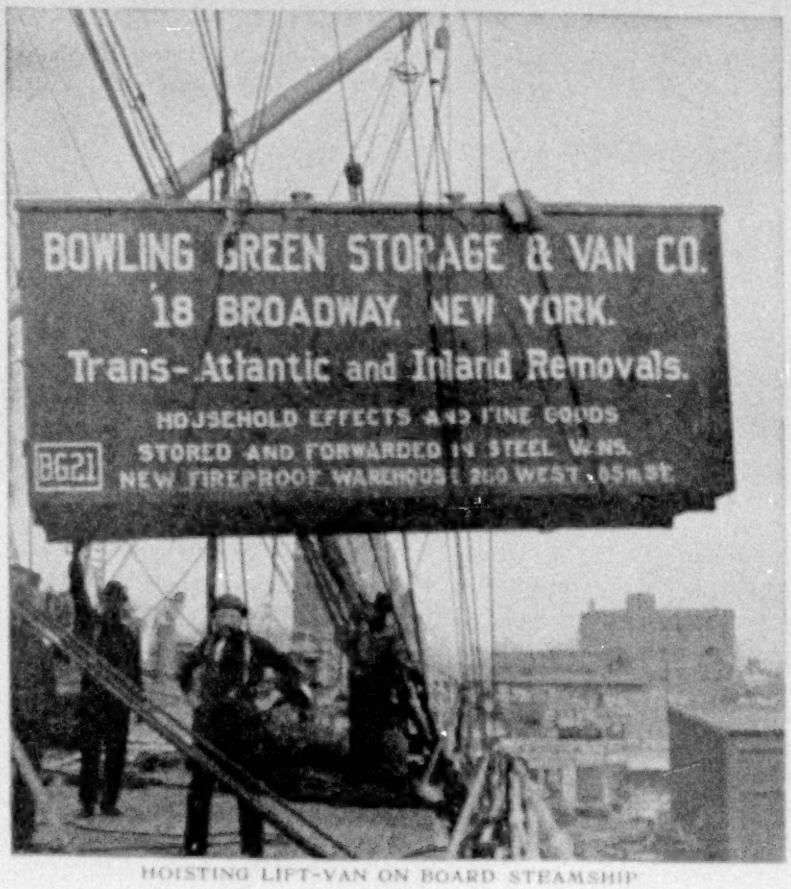

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VOL. XXI, No. 1 WASHINGTON JANUARY, 1910

THE NATIONAL GEOGRAPHIC MAGAZINE

THE NATIONAL GEOGRAPHIC SOCIETY'S ALASKAN EXPEDITION OF 1909

BY RALPH S. TARR, OF CORNELL UNIVERSITY, AND LAWRENCE MARTIN, OF THE UNIVERSITY OF WISCONSIN
LEADERS OF THE EXPEDITION

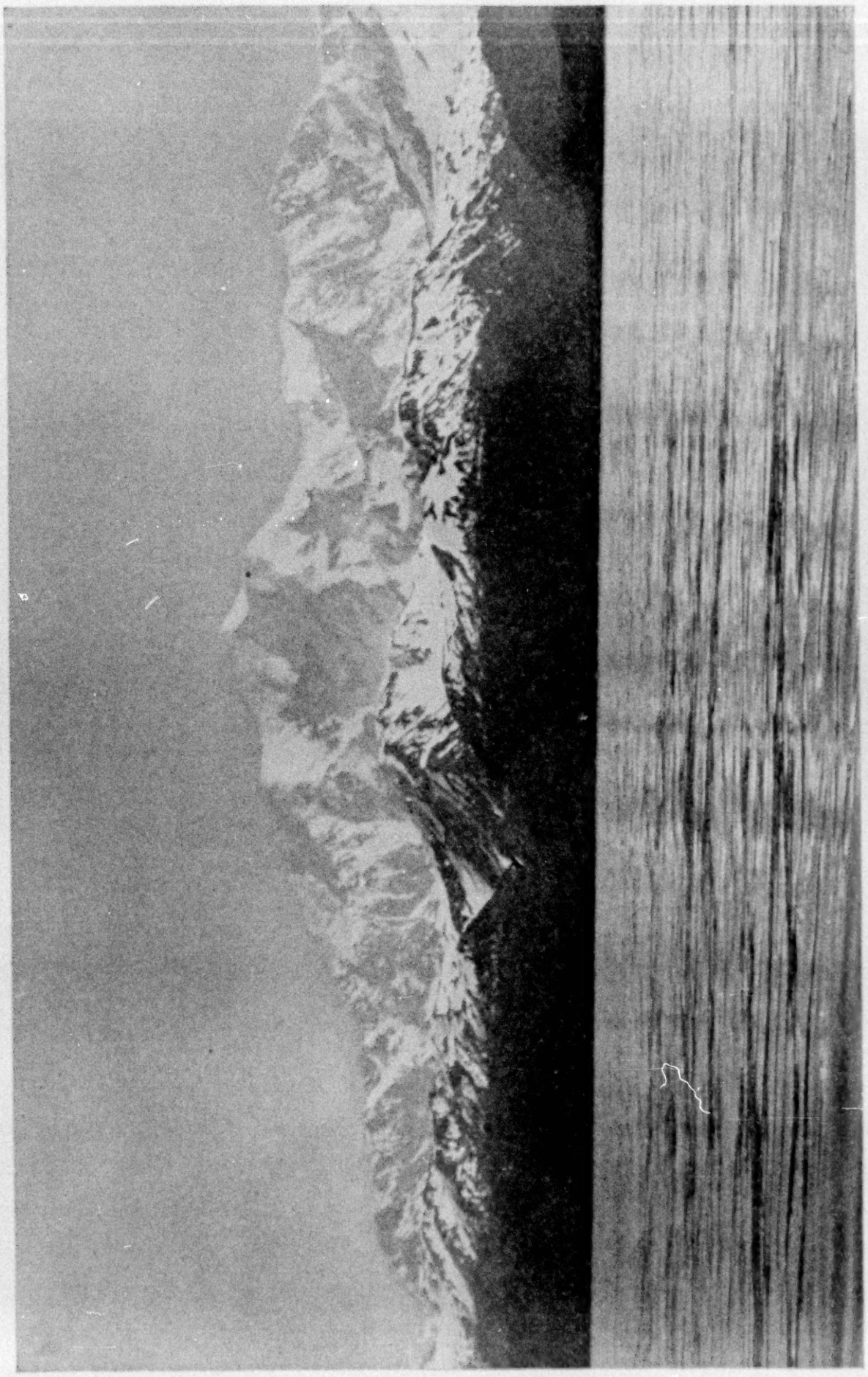
THE research expedition sent out by the National Geographic Society in 1909 devoted the season to a study of glaciers in Yakutat Bay and eastern Prince William Sound, Alaska. Beside the leaders of the expedition, the party consisted of six men. The topographer, Mr W. B. Lewis, of the U. S. Geological Survey, was furloughed by the Survey in order that he might be employed by the expedition. The other members of the party were a photographer, Mr Oscar von Engeln, of Cornell University; a geological assistant, Mr E. F. Bean, of the University of Wisconsin; a boat engineer, one camp hand, and a Japanese cook. The senior author had previously spent two seasons in Yakutat Bay, the junior author one season there and part of another in eastern Prince William Sound.

The party sailed from Seattle June 24, going via the Inside Passage and Juneau, and reaching Yakutat five days later. A 28-foot whale-boat with 4-horse-power gasoline engine was used in transporting the party and outfit throughout the summer, though taken on the steamship from Seattle to Yakutat and from Yakutat to Valdez. The first six weeks of the summer were spent in and about Yakutat Bay (June 29 to August 14), the remaining time in eastern Prince William Sound and around the lower Copper River. Two main camps and seven temporary camps were occupied in Yakutat Bay, and three main camps in eastern Prince William Sound. The glacier studies were accomplished by means of travel by water in launch and row-boat, travel by land and glacier on foot, and, in one case, travel by railway automobile over the Copper River and Northwestern Railway.

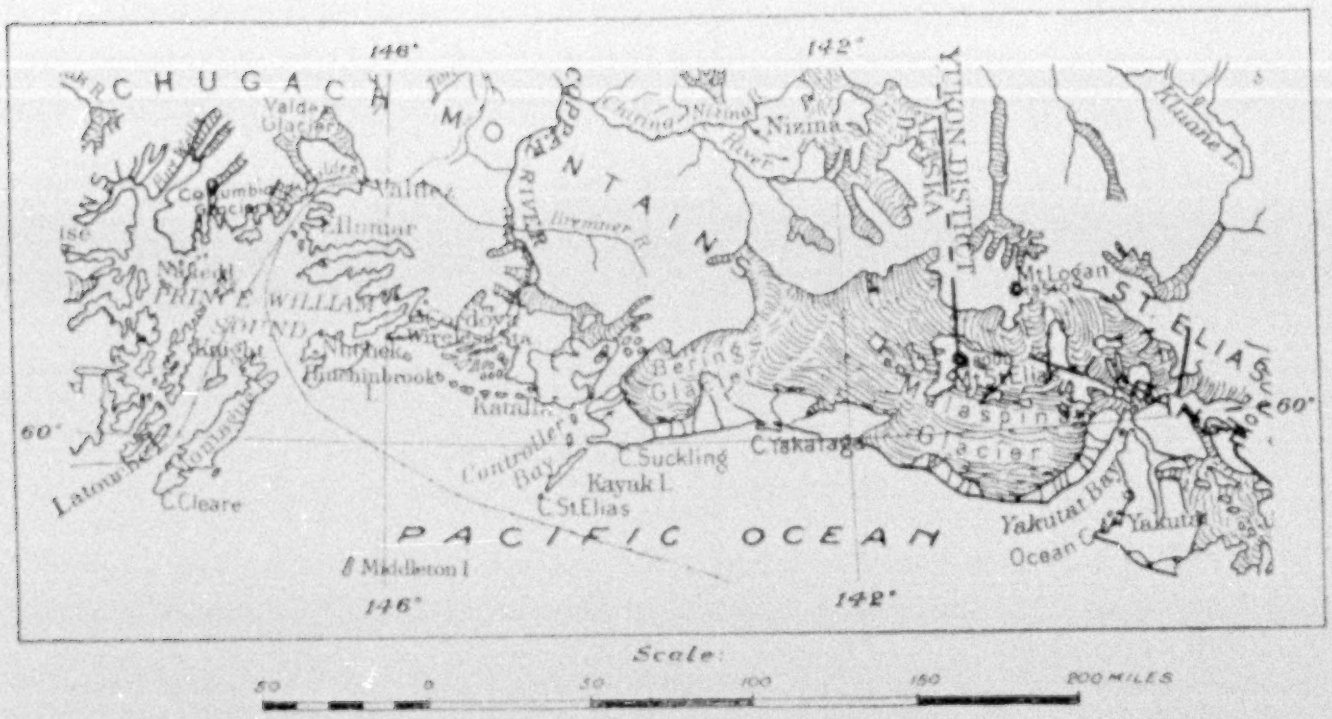
THE COUNTRY VISITED

The country studied is the mountainous region of the Pacific Coast slope of the Saint Elias and Chugach ranges. These mountains rise to heights of 8,000 to 10,000 feet, with peaks reaching 15,000 to 18,000 feet, and with snow fields covering the whole upland above 2,000 to 3,000 feet, except where the slopes are too steep. The upland is bare, cold, and cheerless; the lowland, quite in contrast, may be covered with spruce and hemlock forest or with luxuriant grass and flowers.

The region has a mild temperature,



MOUNT FAIRWEATHER (15,292 FEET HIGH), PHOTOGRAPHED FROM THE PACIFIC OCEAN BY THE NATIONAL GEOGRAPHIC SOCIETY'S EXPEDITION



THE PACIFIC COAST OF THE GULF OF ALASKA

Showing the location of Yakutat Bay, eastern Prince William Sound, and the lower Copper River region, where the National Geographic Society's Research Expedition spent the summer of 1909 in glacier study.

although in the latitude of Hudson Strait the lofty mountains, rising from the coast in the path of the prevailing westerly winds, cause heavy precipitation—81 to 190 inches annually—a large percentage of which falls on the mountains in the form of snow. Great excess of snow accumulation over melting has resulted in the formation of large valley glaciers, which descend from all the mountains, uniting to form the piedmont Malaspina and Bering glaciers and many intermediate piedmont bulbs.

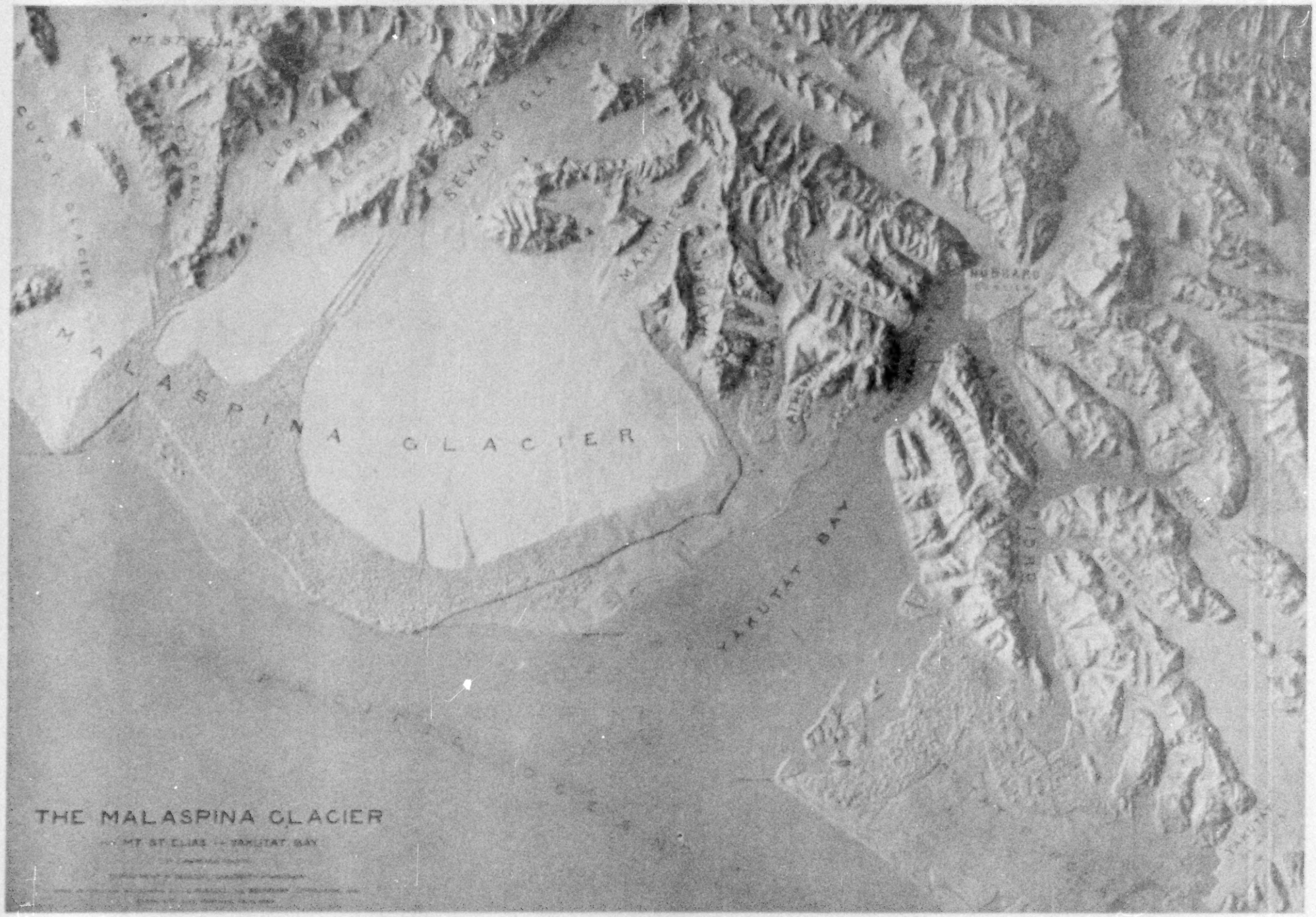
THE LARGEST GLACIERS OUTSIDE THE POLAR REGIONS

The dimensions of the ice masses present is commensurate with the heavy snowfall and the northern latitude, many of the valley glaciers being of exceptional size. The Hubbard glacier* in Yakutat Bay, for example, has a total known length of 28 miles, only the lower portion being explored. It reaches the sea and discharges icebergs from a tidal cliff nearly five miles long and 250 to 300 feet high. Upon its lower surface three of the largest and best known Swiss glaciers—the Aletsch, Rhone, and Mer de Glace—might be superposed without covering the whole width of the glacier, as shown in the figure (see page 5).

The front of this glacier is so high that a man's figure looks puny against it, and, indeed, a lofty modern office building, such as the Masonic Temple, in Chicago, might stand beside it and the roof would barely overtop the ice cliff, which also extends deep beneath the waters of the fiord. The *Times* building, in New York city, approximately equal in height to the Hubbard or Turner glacier front, is dwarfed by the giant mountains whose 8,000-foot peaks tower in the background.

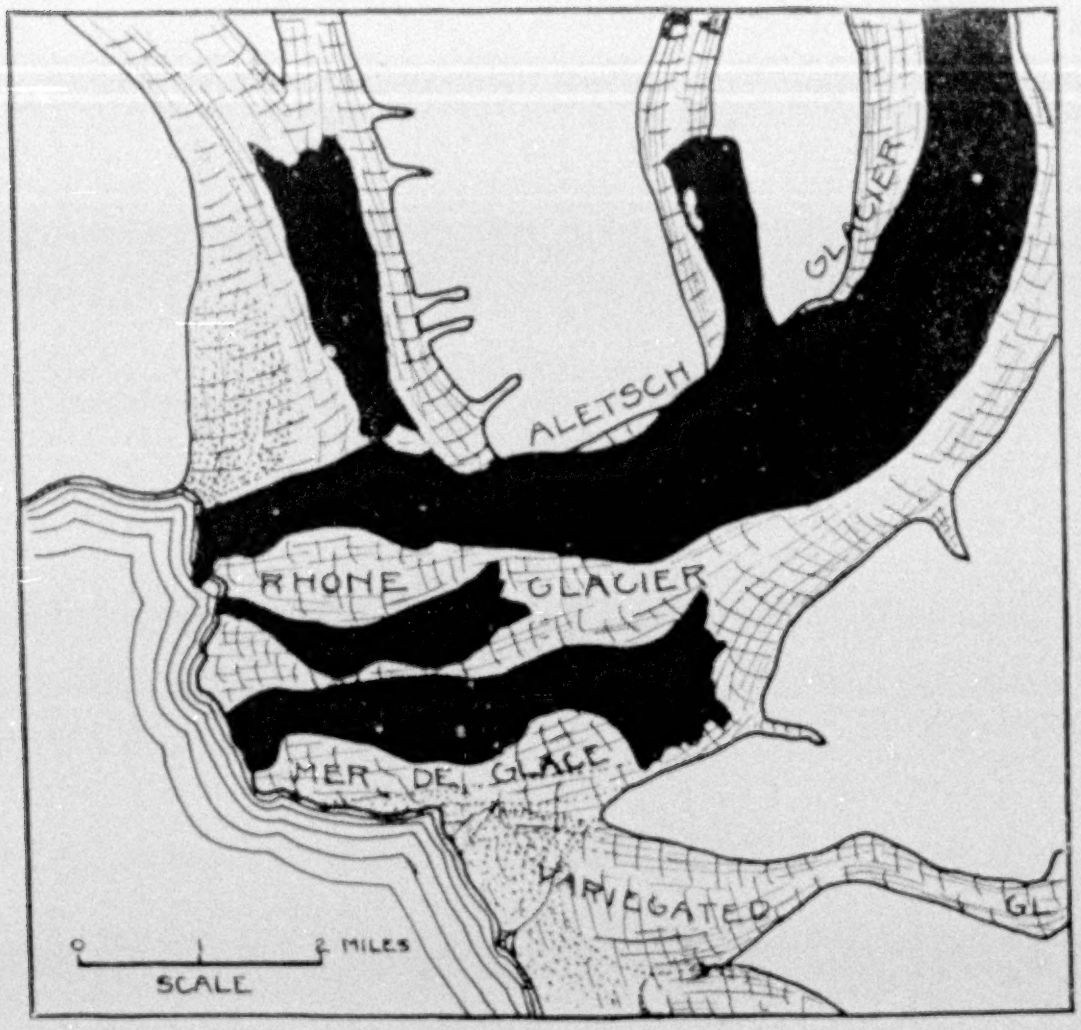
The whole city of Washington, laid out upon the surface of Columbia glacier, gives a specific conception of the magnitude of these ice masses. One who has walked from the Capitol to the White House, or from the Navy Yard to the

*Named after Gardiner Greene Hubbard, first President of the National Geographic Society, by Prof. Israel C. Russell, who discovered the glacier in 1890 while leading the National Geographic Society Expedition to Alaska of that year.



MAP OF MALASPINA GLACIER, MOUNT SAINT ELIAS, AND YAKUTAT BAY

By Lawrence F. Martin, Department of Geology, University of Wisconsin. This glacier was discovered in 1791 by Alejandro Malaspina, a native of Italy in the service of Spain



THE LOWER PORTION OF THE HUBBARD GLACIER, WITH THREE GLACIERS OF THE SWISS ALPS SUPERIMPOSED UPON IT

All four glaciers are drawn upon the same scale, those from Switzerland being shown from the snowfields to the end of the ice tongue. The contrast of width and length of these glaciers in Switzerland and in Alaska is notable.

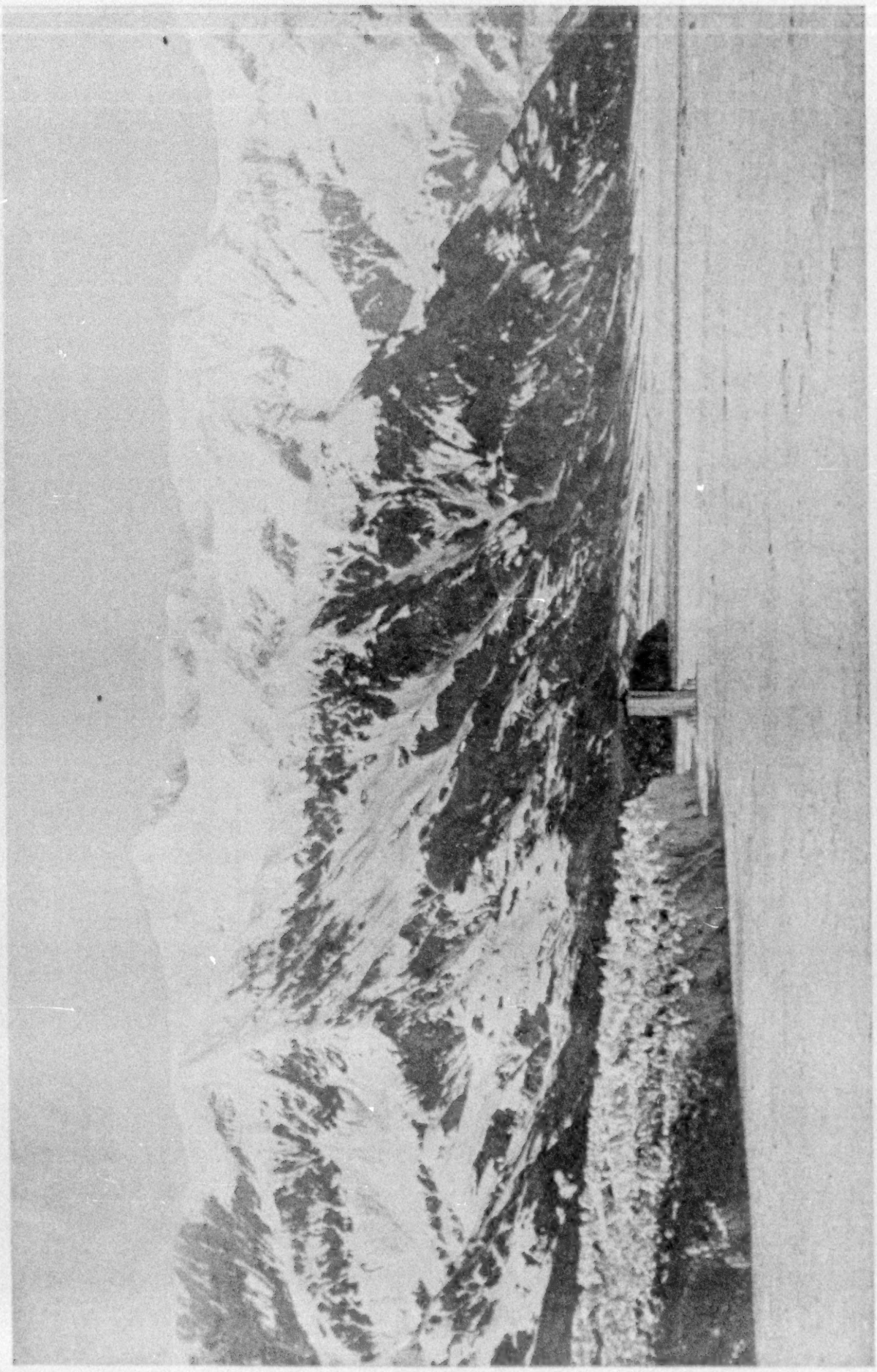
Zoological Park, can appreciate this distance across Columbia glacier (see p. 10).

The Malaspina glacier, however, fed by Agassiz, Seward, Marvine, and other valley glaciers which rival or exceed the Hubbard and Columbia in size, is so large that the whole State of Rhode Island could be laid out upon its 1,500 square miles of surface, or all of eastern Massachusetts. On the accompanying map it may be seen that if Boston were located in the eastern part of the Malaspina glacier the cities of Worcester and Gardner, in central Massachusetts, would be near the west edge (see page 9).

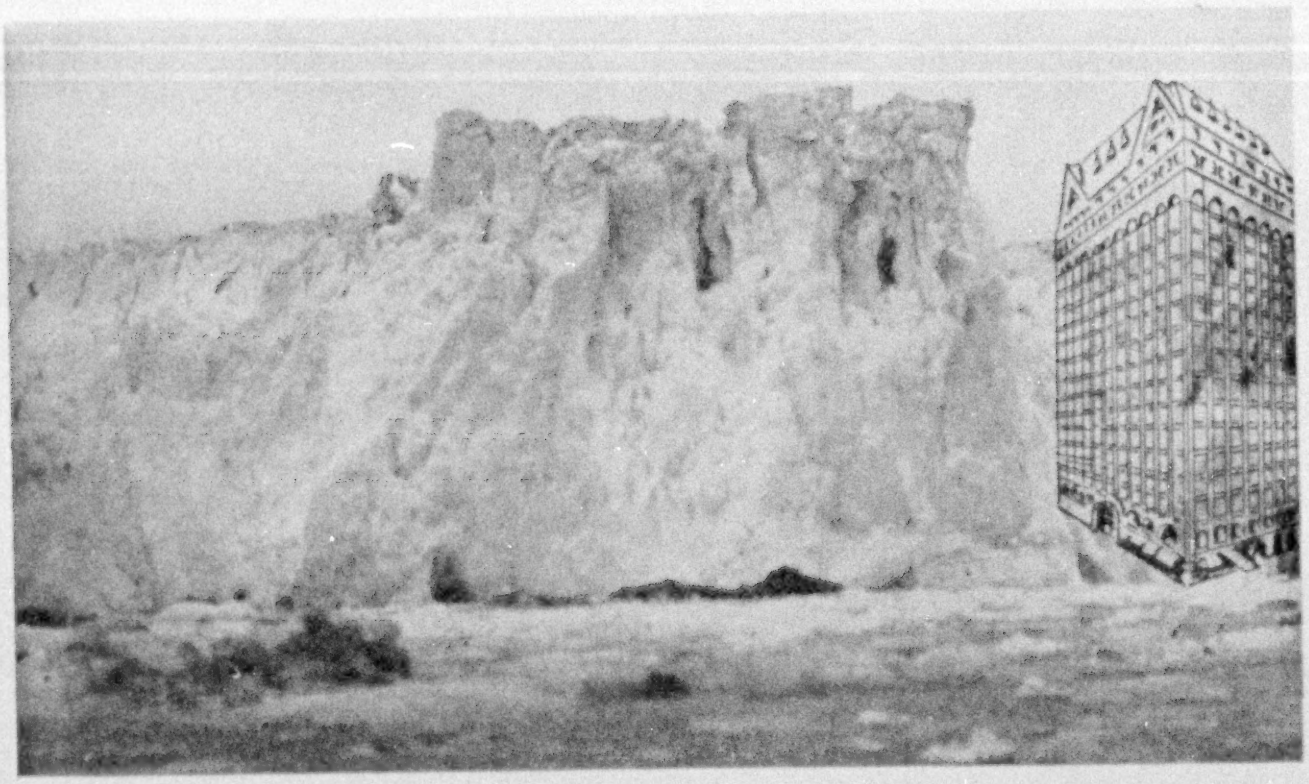
It was with ice masses varying in magnitude from that of Malaspina, Hubbard, and Columbia glaciers to the almost innumerable minor ice tongues that the investigations of the National Geographic Society's Alaskan expedition of 1909 dealt.

INCIDENTS OF A DAY

The day's work in Alaskan glacier study naturally introduces a variety of incidents, with the whole party sometimes united and sometimes divided; one group engaged in observation of the ice tongues, another in making topographic maps, a third in sounding in the fiord, etc. The day may start as early as half past four, and, in one case, began an hour earlier, because the Japanese cook made a mistake. Breakfast is eaten, apparatus and lunches are packed, and the start is made. It is light for twenty to twenty-four hours, so the start and return can be made at convenience.



TURNER GLACIER CLIFF COMPARED IN HEIGHT WITH THE NEW YORK TIMES BUILDING
Mountains in background, 10,000 to 11,000 feet



THE HUBBARD GLACIER CLIFF COMPARED IN HEIGHT WITH THE MASONIC TEMPLE IN CHICAGO

The innumerable branches of a glacial torrent often interpose obstacles to direct travel; the crevasses of a glacier surface make frequent detours necessary. While we were stopping for lunch at a glacier margin one day a series of avalanches built up a deposit of mud and stones 50 feet by 100 and from 5 to 30 feet thick. It contained boulders as much as 6 feet by 4 by 4 and shifted a stream 50 feet laterally into an alder thicket.

A brown bear with a half-grown cub, meeting one on the march and coming up to within 20 feet, lead one to sometimes wish for a gun, and, subsequently, to regret lack of presence of mind in utilizing the camera. The submerging at midnight of a camp on the beach by an exceptionally high tide, so that the water stands 14 inches deep on the tent floor, is not the pleasantest of incidents.

These accidents, however, are easily forgotten exceptions to the general rule of glacier study in Alaska. The series of beautiful panoramas of mountain and plain, fiord and glacier, the excellence and variety of glacial phenomena exhibited—all these lend zest to the work and make the season among the Alaskan glaciers far too short.

THE ENTERPRISE OF VALDEZ

In the regions visited by the National Geographic Society's Expedition the relations of the glaciers to life are striking. When stagnant and moraine-veneered the glaciers are the seat of abundant vegetation, which is destroyed when the ice tongues advance and when they melt and the moraine soil slumps down. As glaciers retreat, vegetation follows. The gravelly stream bottoms are the seat of vegetation which is easily destroyed by the rapidly shifting glacial streams.

The Malaspina and adjacent glaciers are used as highways of travel, the former being utilized by the mountain climbers, Russell, Bryant, and Abruzzi. The Nunatak and Fourth glaciers were crossed by hundreds of prospectors during the gold rushes, the latter being still a highway to the Alsek Valley. Glaciers and glacial streams also erode, transport, and deposit the gold which later concentration has made it profitable to wash on some of the Yakutat Bay beaches.

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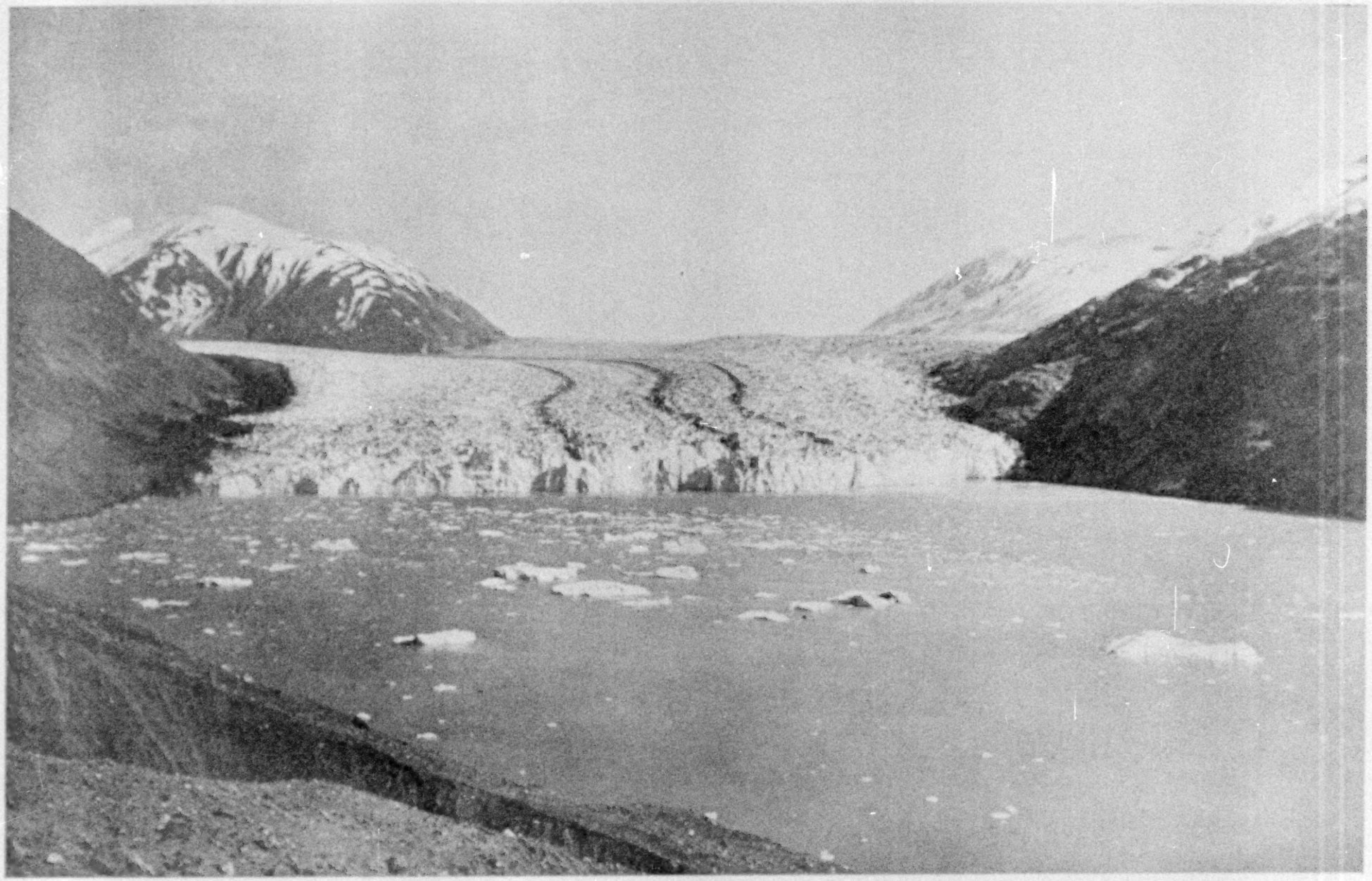
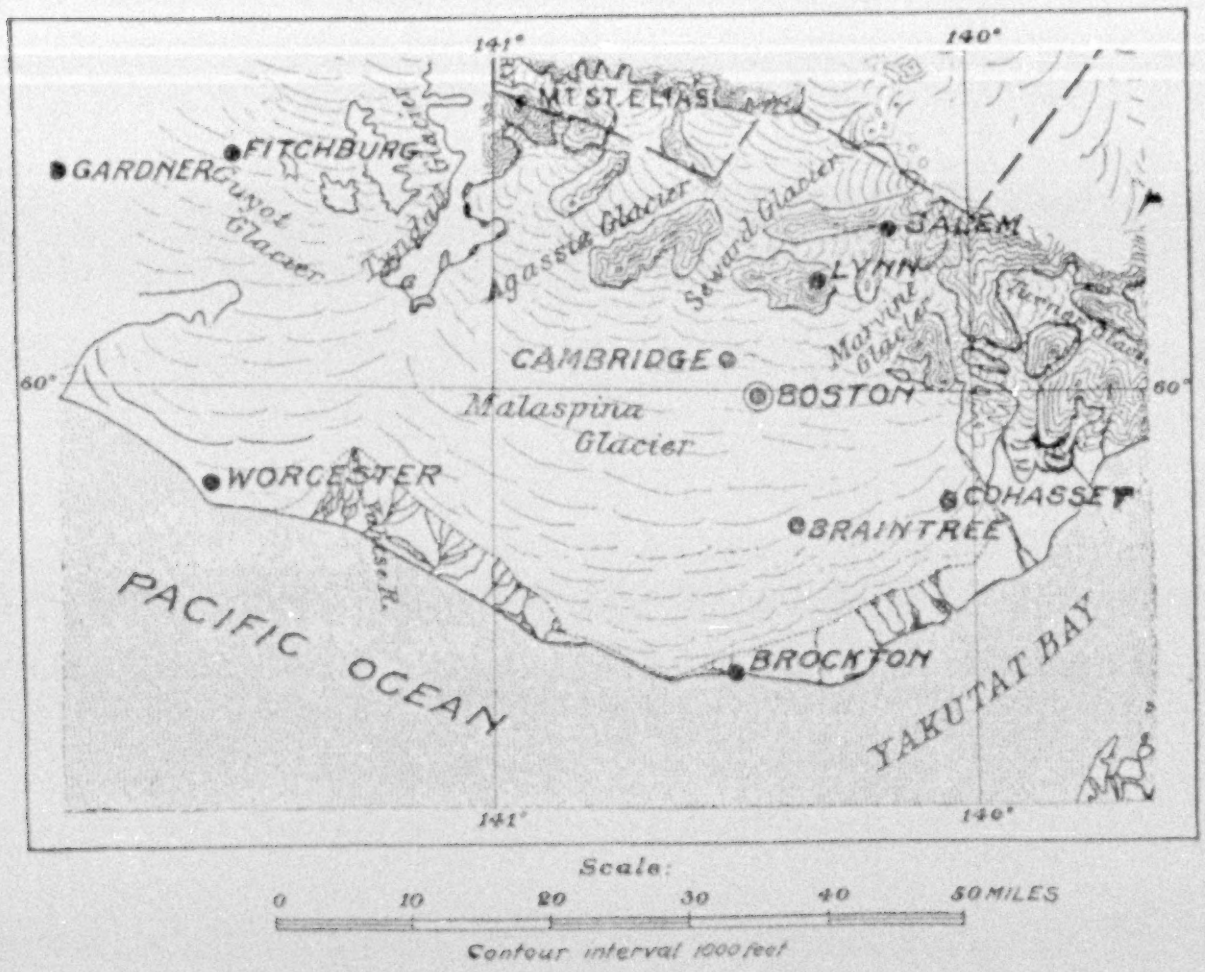


NUNATAK GLACIER AND ITS ICEBERGS (SEE ALSO PAGES 40 AND 44)



THE MALASPINA GLACIER, THE LARGEST IN THE WORLD OUTSIDE THE POLAR REGIONS

It is larger than Rhode Island or the eastern half of Massachusetts. The distances are shown by the location of the cities of Boston, Worcester, Gardner, Brockton, Cohasset, etc.

In eastern Prince William Sound Valdez glacier is the most famous of the glacier highways, and was traversed in the years of the gold rushes by four or five thousand prospectors.

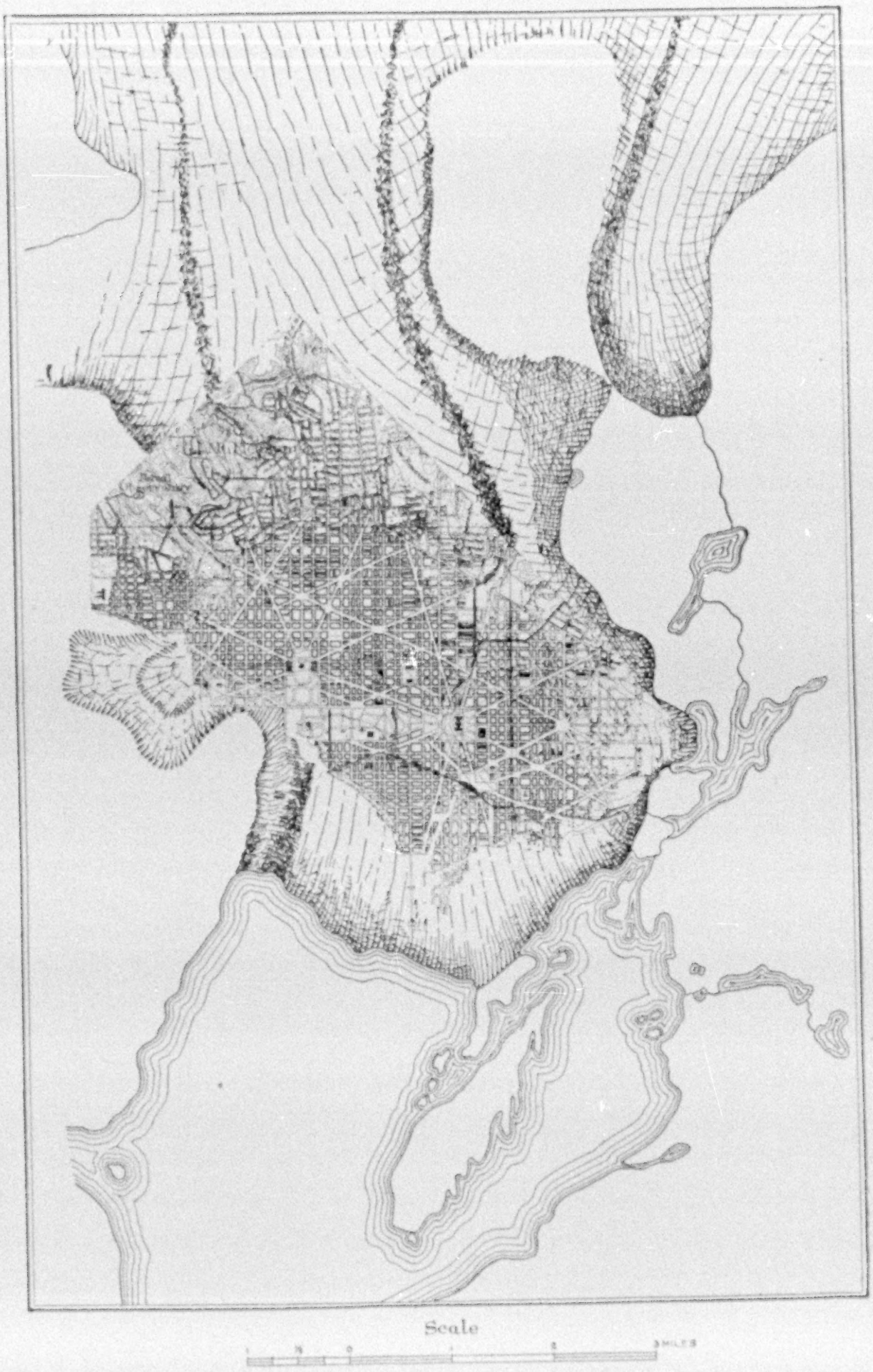
The city of Valdez was located here because this ice-filled pass was possible to cross, and the exact location is determined by the head of ocean navigation on the fiord and a convenient plain built by glacial streams. Not long ago the city was threatened by floods from these same glacial streams. The glacier highway is no longer utilized, but the townsite is an equally convenient terminus to the government telegraph line, trail, and wagon road, several proposed railways, and the winter mail route to the Fairbanks gold camps on the Tanana River.

The enterprise of Valdez citizens has provided an automobile service between the town and the glacier, and on days of steamer visits the automobile makes many trips over the four-mile roadway that connects the glacier and dock. This is probably the only place in the world where automobile service over a glacial outwash plain takes the traveler to the very edge of an ice tongue.

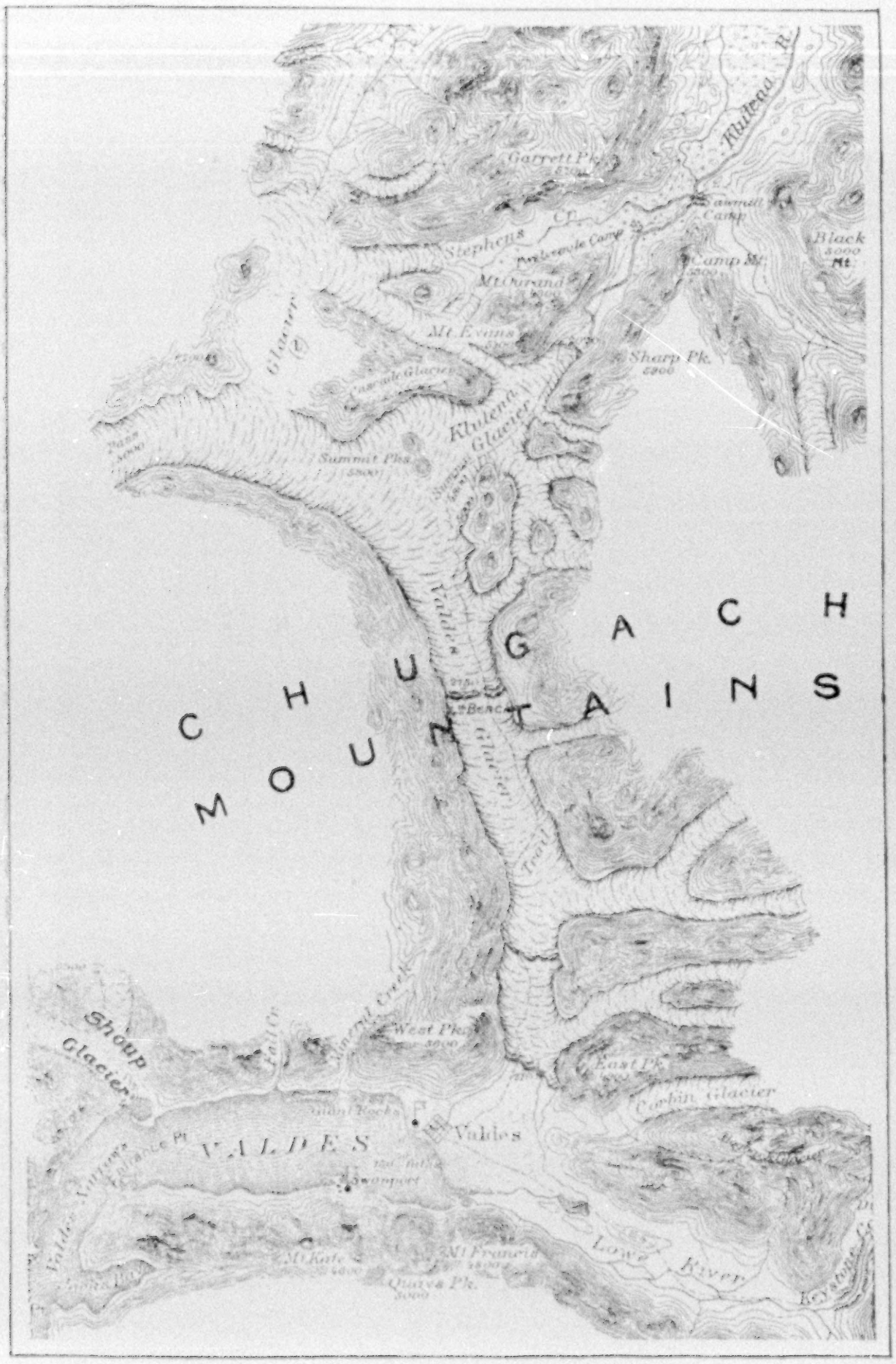
The Shoup glacier, near by on Valdez fiord, is utilized by the United States Army as an ice-house, the soldiers from Fort Liscum, across the bay from Valdez, filling a lighter periodically with small icebergs from this glacier and towing them ten miles to the fort.

FORESTS DESTROYED BY ADVANCING GLACIERS

Around the Columbia glacier, as near the Lucia glacier of Yakutat Bay, the advance of the glacier into mature for-



THE COLUMBIA GLACIER, PRINCE WILLIAM SOUND, WITH THE CITY OF WASHINGTON DRAWN TO THE SAME SCALE FOR PURPOSES OF COMPARISON (SEE PAGES 30-33)



THE VALDEZ GLACIER HIGHWAY (AFTER SCHRADER, MAHLO, AND LOWE)

An ice-filled pass across the Chugach Mountains, crossed by thousands of prospectors. The Shoup glacier, used as an ice-house by the soldiers at Fort Liscum, near Swanport (see page 9)

THE CASCADING GLACIER AND MOUNT DRAPER

That the ice is able to remain on so steep a slope is due to a series of rock terraces, descending westward, which were sculptured by glacial erosion during a higher stage of Nunatak glacier. These terraces form steps upon which the ice rests, giving the appearance of an ice cascade.

ests during the summer of 1909 was resulting in the large-scale destruction of life. Ten years before, Dr G. K. Gilbert and the Harriman Expedition had found that the Columbia glacier was retreating from an advance into the forest, dated tentatively as in 1892. Professor U. S. Grant found that the Columbia glacier retreated 160 feet between 1899 and 1905, and readvanced 112 feet between 1905 and 1908. In the spring of 1909 he observed the continuation of this advance, seen also by the National Geographic Society Expedition in August. Mature trees had grown up to the very edge of Columbia glacier, and a readvance, overturning trees, thrusting splinters of ice up among their very branches, and rolling the peaty soil into great bolsters and terminal moraine ridges, include some of the profoundest effects of glacial conditions upon life (see pp. 32 and 37).

Where the great Copper River breaks through the lofty Chugach Mountains are displayed some of the most striking relationships between glaciers and human life. This water route to interior Alaska has always been blocked by lateral glaciers entering the Copper River Valley and causing ice barriers and rapids in the stream course. Few of the Russians succeeded in getting up the Copper, and difficulties here led to the utilization of the glacier highway at Valdez by most of the prospectors.

The army officer, Abercrombie, ascended to the Miles and Childs glaciers in 1884, and his photographs showing the glaciers and river there are almost identical with present conditions. Lieutenant Allen, in his brilliant explorations of 1885, passed these glaciers, as did Dr C. W. Hayes and Lieutenant Schwatka in 1891.* Hayes made the first detailed map of Miles, Childs, and Baird glaciers.

The map reproduced herewith, modified with a map made in 1900 by Schrader, Gerdine, and Witherspoon, shows the conditions. Miles and Baird glaciers, emerging on opposite sides of the valley, expand in piedmont bulbs. The Copper River writhes between them, forced first against one mountain wall, then the other. Above the glacier dams are lake-like stretches of the river. Childs glacier thus dams the Copper, causing a lake into which Miles glacier discharges icebergs from a cliff three miles long. There are similar slack waters above Miles and Baird glaciers. Opposite the glacier ends the river is constricted into foaming rapids (p. 25).

THE GREATEST SCENIC RAILWAY IN THE WORLD

Under these difficult conditions a railway is being built. Its difficulties include three great bridges across the shifting glacial torrent of Copper River. They include expensive rock cuts, curves, etc., at Abercrombie Rapids, where Miles glacier and the river occupy the whole valley, forcing the railway to the mountain side. They include the laying of five miles of track *on the ice* of Baird glacier, whose advance would destroy the line and whose melting will keep it continually under repairs (see pages 23–25).

The project is daring, unique, but possible. Careful study has determined the necessities. Large capital has enabled wise work. Able engineers, including Messrs E. C. Hawkins, M. J. Heney, and Alfred Williams, who built the White Pass and Yukon Railway, are coping with the problems one by one. Men have never before built railways close to, between, and on great glaciers. But that it can be done is being proved in Alaska. The rich copper deposits north of the Chugach Range, near Mount Wrangell, and perhaps the valuable coal fields of the Controller Bay region, will soon be connected by rail with the growing port of Cordova, on eastern Prince William Sound.

Moreover, this will be the greatest scenic route in the world. Nowhere else can one step from an ocean steamship to a railway car, and ride through foothills, then over a great glacial delta to and between giant ice tongues two and eleven miles respectively in width, around the stagnant, moraine-veneered bulb of the

* NATIONAL GEOGRAPHIC MAGAZINE, vol. iv, 1892, p. 126.

northern part of Miles glacier, past the beautiful Abercrombie Rapids, and over five miles of the stagnant Baird glacier. Here ice underlies the ties and rails, and a moraine with alders and cottonwoods covers the icy slope on one side, while the other is washed by the Copper River. All this we saw from a railway automobile or on foot, but readers of the NATIONAL GEOGRAPHIC MAGAZINE may see it next year from a train.

MANY GLACIERS SUDDENLY BEGIN A RAPID ADVANCE

In 1890 and 1891, when Professor Russell visited Yakutat Bay, during his explorations of the Mount Saint Elias region, under the auspices of the National Geographic Society and the United States Geological Survey, and in 1899, when Messrs Gilbert, Gannett, and other members of the Harriman Alaska Expedition entered the bay, the glaciers were found to be in a state of general recession. The authors of this article, in 1905, found clear evidence of continued recession of the glaciers of Yakutat Bay, the one notable exception being Galiano glacier.

In 1890 this glacier was covered by a dense growth of alder and cottonwood on its lower, stagnant, moraine-covered end, but in 1905, to our amazement, this forest cover was entirely destroyed. This remarkable change in condition of Galiano glacier puzzled us greatly, and the only hypothesis which we were able to suggest was that the series of vigorous earthquakes that visited the Yakutat Bay region in September, 1899, had in some way caused such an advance in the Galiano glacier as to completely destroy the vegetation which had previously clothed its lower end. The explanation was proposed as only a vague hypothesis forced upon us by the failure of other possible explanations; and we were not only ignorant of the nature of the process and its behavior, but wholly unprepared for the results which the hypothesis necessitated in other neighboring glaciers; for an advancing glacier under earthquake impulse was hitherto an unknown phenomenon of nature.

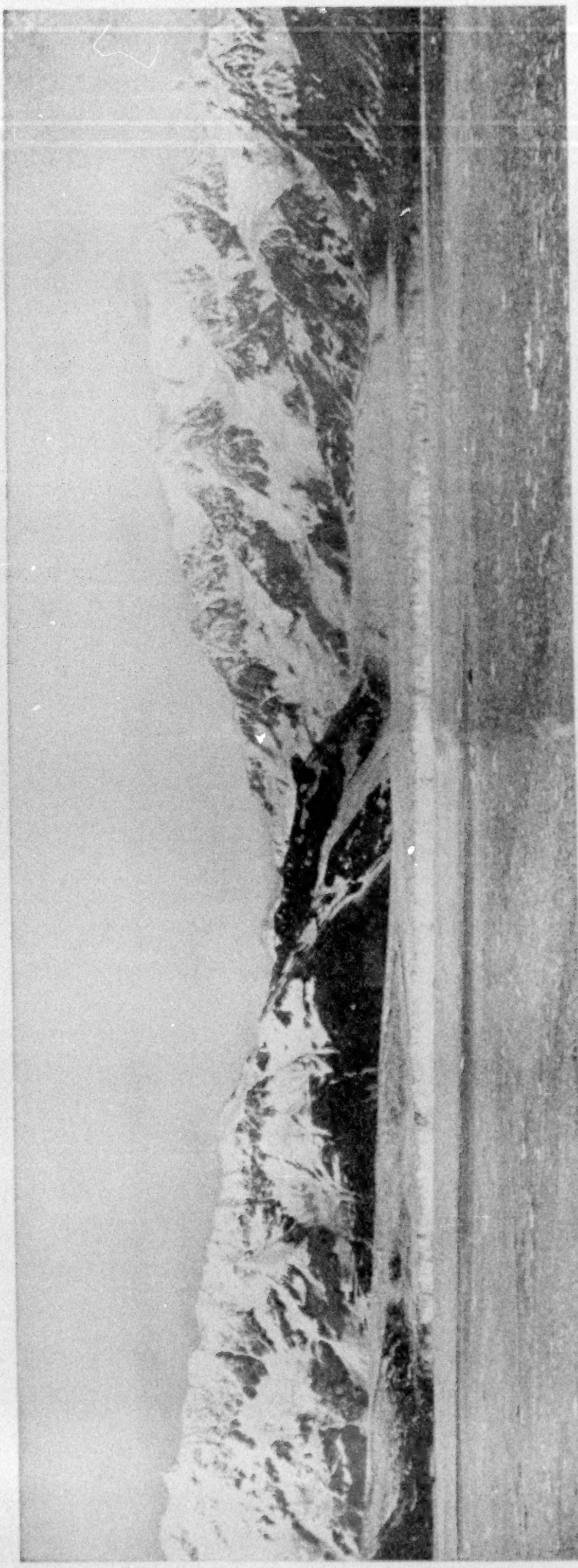
It was therefore a great surprise to the senior author when he returned to the Yakutat Bay field in the following summer (1906) to find that, although some glaciers had remained unchanged and others had continued their recession, so long in progress, four glaciers had undergone an abrupt and absolute transformation, similar to that of the Galiano glacier prior to 1905. One of these, the Variegated glacier, an alpine glacier of moderate size, which expands in a piedmont bulb beyond the mountain base, was carefully studied in 1905. Its lower end was essentially stagnant and covered with a sheet of ablation moraine arranged in bands of various colors, whence the name of the glacier. Over this moraine we could travel at will in any direction, and up the valley glacier within the mountain walls we made an excursion, in August, finding no other difficulty in traveling over the ice surface than that of an occasional crevasse which broke the otherwise smooth surface, and here and there a mound or ridge of moraine which rose above the clear ice that constituted the larger portion of the glacier within the mountain walls.

Nine months later all this was changed. The smooth, clear ice of the valley portion of the glacier was transformed to a sea of crevasses and seracs, like the broken ice of the ice falls in alpine glaciers; and the crevassing extended out into the moraine-covered piedmont bulb beyond the mountain base. Here not only was the ice so broken that it was impossible to travel on it, but it had thickened perceptibly and advanced noticeably. So great and absolute was the change in so short a time that it seemed almost incredible, and was wholly without precedent.

THE HAENKE GLACIER ADVANCES A MILE IN ONE YEAR

To the west of Variegated glacier lies the great Hubbard glacier, and still farther on the Turner glacier, also large, but

A MEADOW NEAR THE SEA, WHERE THE LUXURIANT VEGETATION CONTRASTS WITH THE BARE, COLD UPLANDS OF THE SAINT ELIAS RANGE



PANORAMA OF HUBBARD GLACIER: HUBBARD MOUNTAIN (12,964 FEET) IN BACKGROUND IN CENTER

This glacier and mountain were named for Gardiner Greene Hubbard, first President of the National Geographic Society. The mountain on the right is Mount Seattle

much smaller than the Hubbard. These two glaciers, ending in the bay in lofty ice cliffs, from which icebergs are constantly being discharged, had not suffered any notable change, but between them are two glaciers, to which no name had as yet been given, one of which, now called the Haenke glacier, had been subjected to changes similar to that of the Variegated glacier, while the other was unchanged. From a nearly stagnant, moraine-covered condition the Haenke glacier had become crevassed to an impassable condition, and its end had moved forward for about a mile. In September, 1905, its visible terminus was on an alluvial fan a quarter of a mile or more from the sea, but in June, 1906, the front was in the sea discharging icebergs and its sea cliff was united with that of Turner glacier.

Still proceeding westward, beyond Turner glacier came the Black glacier, which was unaltered; Galiano glacier, already mentioned, and then Atrevida glacier. In 1905 we were able to ascend the moraine-covered margin of the Atrevida with ease, and we wandered over its ablation moraine at will, while as late as September, 1905, the junior author made a trip completely across the glacier, as Russell had done on his way to Mount Saint Elias in 1890.*

*National Geographic Magazine, vol. iii, 1891, p. 92.

REMARKABLE CHANGES IN THE ALTREVIDA GLACIER

In June, 1906, the Atrevida glacier was marvelously transformed. Its margin was no longer moderately sloping and moraine-covered, but in its place rose a jagged ice cliff, advancing into the forest, and pouring into it a stream of boulders and other morainic debris that was constantly sliding down the newly formed ice cliff. The ice was in motion before our very eyes, and the cracking of the glacier, the tumbling of boulders, and the dislodging of huge ice blocks was heard on every hand. Viewed from a neighboring mountain top it was seen that the entire surface of the Atrevida glacier, from its valley head far out into its expanded, alder-covered piedmont bulb, was a mass of yawning crevasses. Travel over this tumultuous sea of broken ice was utterly impossible, and even the ascent of the margin was possible only by cutting ice steps all the way (see p. 39).

In a period of nine months a stagnant, or nearly stagnant, moraine-covered glacier had advanced, thickened, and become broken into an impassable condition, but neighboring glaciers showed no change from their condition of the previous year. For instance, the Lucia glacier, whose piedmont bulb joins that of the Atrevida on the west, and the Hayden glacier, further west, were unchanged.

West of the Hayden glacier the next large glacier is the Marvine, which descends from the mountains to form the eastern lobe of the great piedmont Malaspina glacier. This had been transformed as the Variegated, Haenke, and Atrevida had been. Where Russell easily crossed it in 1890, near its emergence from the mountain valley, the Marvine was now an impassable sea of seracs, and the eastern portion of the Malaspina, as far as Point Manby, at the western entrance to Yakutat Bay, was so broken that travel over its surface was no longer possible; yet it was over this portion of the Malaspina glacier that Russell traveled in 1890 and the Duke of the Abruzzi and Mr Bryant in 1897. The junior author saw the Malaspina and terminus of the Marvine in September, 1905, when it seemed exactly as in 1890. In 1906 the whole eastern margin of the Malaspina was observed by the senior author as a broken, jagged ice cliff, which was advancing in August, 1906, and destroying the forest that grew in the ablation moraine that had accumulated on this stagnant portion of the glacier.

EXPLANATION OF THE ADVANCE

In seeking an explanation for these phenomena there was no assistance to be gained from previous records of glacial changes, for such abrupt transformation of glaciers had never before been witnessed. Some unusual cause must have been in operation to have transformed stagnant ice into the broken, crevassed condition of rapidly moving glaciers, and to have caused a sudden forward movement and thickening of the lower portions of the glacier. Such an unusual cause at once suggested itself, for in September, 1899, the Yakutat Bay region was the center of a series of earthquake disturbances of great severity, and to the study of the effects of these earthquakes we had in 1905 given much attention, finding clear evidence of an uplift of the coast line (in one place to an elevation of 47 feet), of depression, of several fault lines, and of numerous avalanches.

As a result of a consideration of the phenomena observed in 1906 and of their possible explanation the senior author put forward the following theory as the only one that could adequately account for the facts, and against which there were no fatal objections:

In September, 1899, the severe shaking of the mountains during the earthquakes caused extensive avalanches of snow, ice, and rock from the lofty mountains into the reservoir of the glaciers of the Yakutat Bay region. This added so much to their supply that in time a response must necessarily be felt in the glaciers themselves. In the short Galiano glacier, and perhaps in others where not observed, the response occurred before 1905, and in 1906 the four glaciers mentioned were

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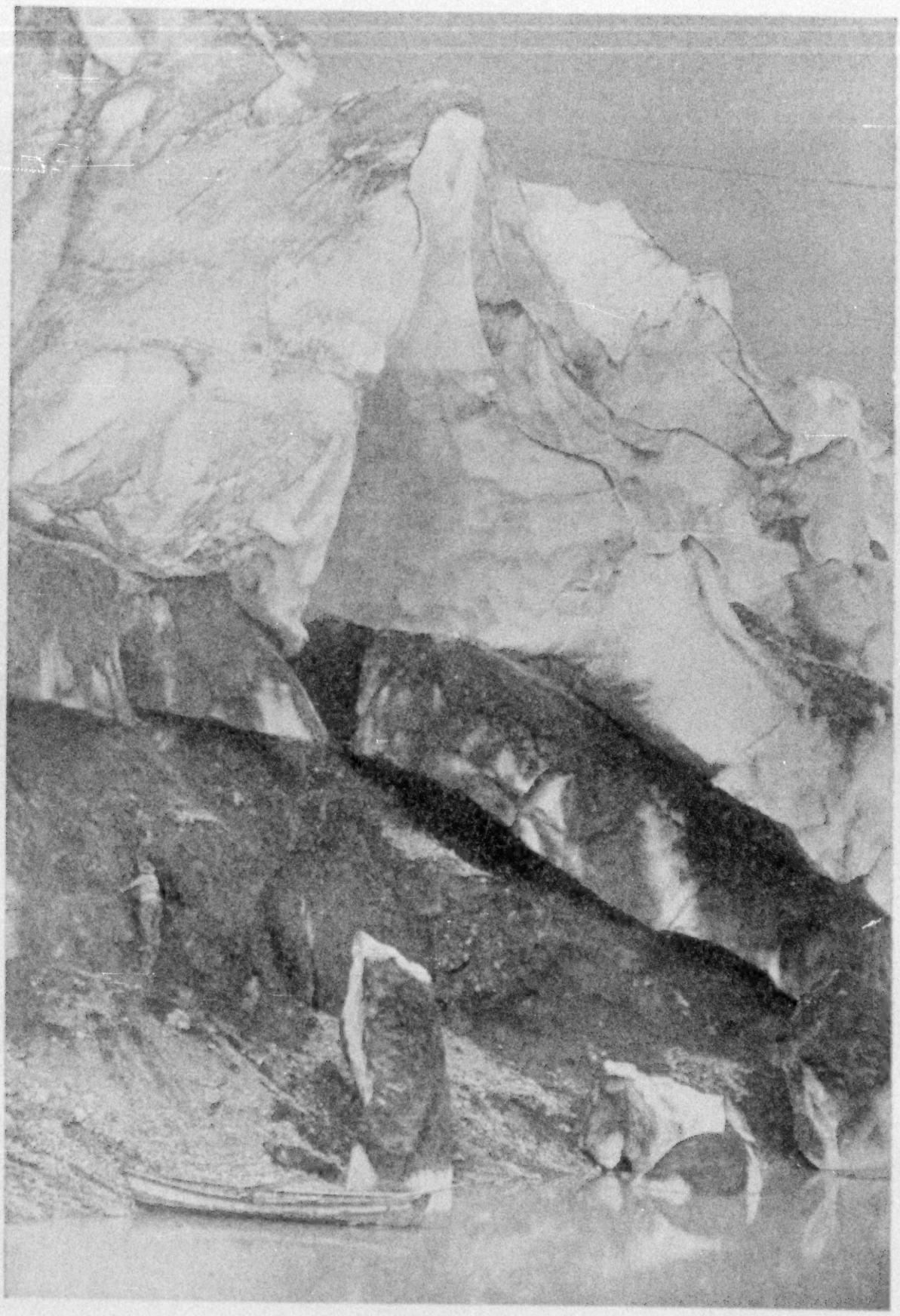


SHOUP GLACIER, PRINCE WILLIAM SOUND

A glacier front of only moderate height, but one beside which the man's figure (left of lower center) looks puny. The American soldiers stationed at Fort Liscum obtain their ice supply from this glacier cliff (see page 9).

exhibiting the full effects of the response in the sudden addition to their snow supply. As the abrupt melting of snow in the headwaters of a river causes a flood which, in time, sweeps to the very river mouth, so in these glaciers the great and unusual addition of snow and ice during the earthquakes has given rise to an ice-flood which has swept down to the glacier ends. On this theory, therefore, the phenomena observed are explained as the result of a glacier flood started by earthquake impulse.

The observations of 1905 and 1906 were sufficiently extensive to at least lend strong probability to this theory, and it has been quite generally accepted. It was, however, of great importance to apply further test to the theory and to study the later phases of the phenomena attending such glacier advance; and therefore it was with keen interest that the authors again turned their attention to the Yakutat Bay region in 1909 under the auspices of the National Geographic Society.

If the earthquake theory were the correct explanation of the remarkable changes observed in 1906, three things were to be expected: In the first place, other glaciers should by that time begin to show the effects of the glacier flood; secondly, those glaciers which had already been under the influence of the glacier flood should begin to show signs of its diminution, though just what these signs would be or how rapidly the glacier flood would subside could not be predicted; thirdly, no such profound, spasmodic changes in the glaciers should be found in regions on either side of Yakutat Bay outside the area of severe earthquake shaking.

A study of these three points was the foremost object of the expedition of 1909, and the results of this study were in all cases in support of the theory previously proposed. If further demonstration of the accuracy of this theory were demanded than that previously presented, the results of the expedition of 1909 supply enough to establish the theory on a firm foundation. This additional evidence will be considered under the three phases mentioned above, beginning with a consideration of the new advance.

ADVANCE OF GLACIERS BETWEEN 1906 AND 1909

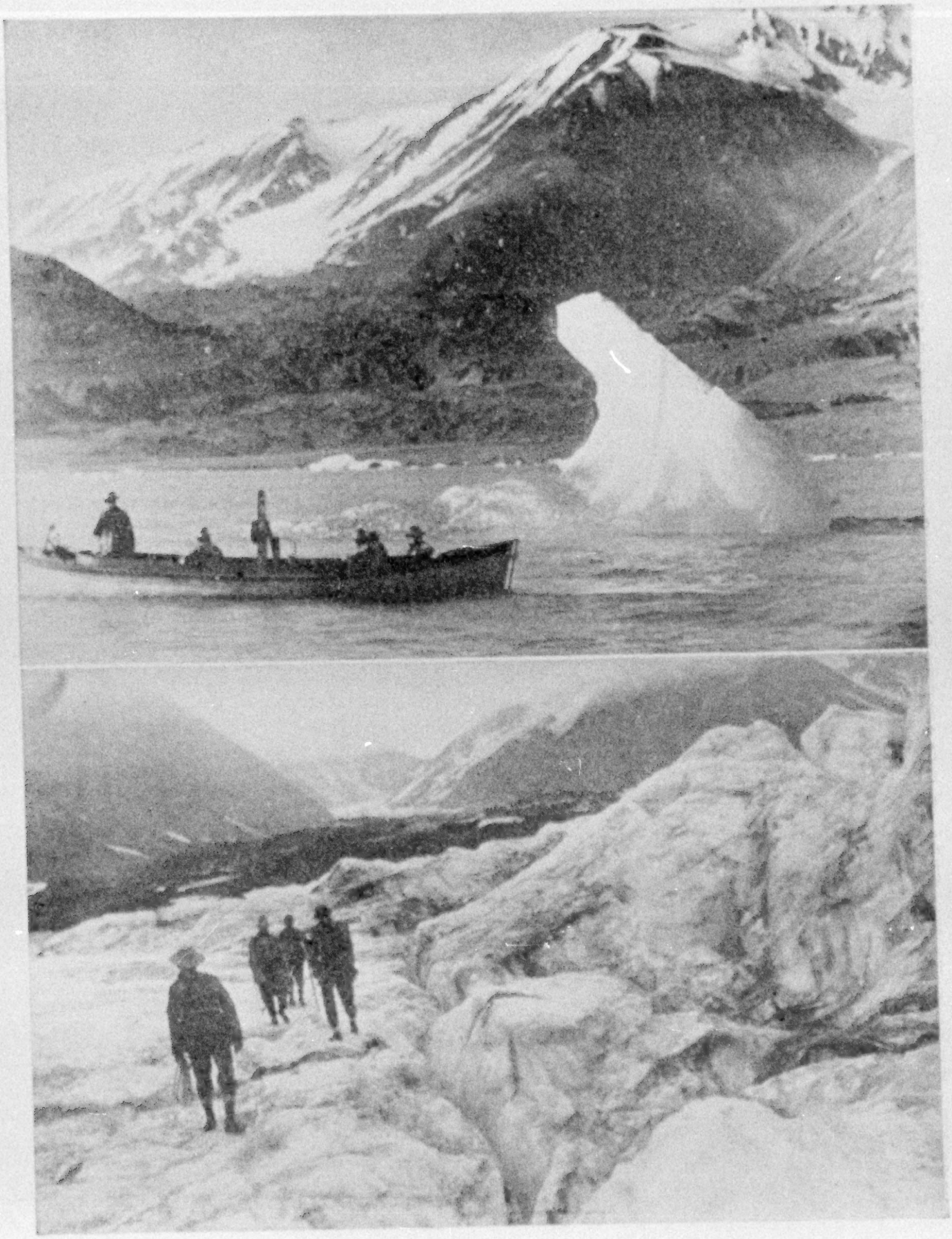
Several of the glaciers of Yakutat Bay have as yet suffered no change as a result of the earthquake shaking, so far as can be seen. This is true, for instance, of the Fourth glacier, which lies just east of the head of Yakutat Bay; of the tidal Nunatak glacier, that has continued the recession which has been in apparently uninterrupted progress since 1891, and whose ice cliff is now a mile and a half or more farther back than in 1899; of the tidal Turner glacier, which appears to be almost as it was in 1890, 1899, 1905, and 1906; of the Hayden glacier, the easternmost tributary to Malaspina glacier, which is in the same state as in 1905 and 1906; and of several smaller glaciers which are in the same state as in 1905 and 1906. But three large glaciers have come under the influence of the glacier flood since last seen in 1906.

Of these the largest and least effected is the tidal Hubbard glacier, which seemed, in 1909, to have just begun to come under the influence of the glacier flood. This is an active glacier, and since first observed by Russell, in 1890, has been crevassed from side to side and has poured a steady stream of icebergs into the fiord from its 5 miles of ice cliff. But beyond the mountains the extreme eastern margin, blanketed by a cover of lateral moraine, has been in a semi-stagnant state, and, where it projected into the sea, rose as a dirt-stained ice cliff from which the discharge of icebergs was infrequent. Back from this ice cliff, on the land, was a moraine-covered ice slope in which little ice showed, and up which it was easy to climb to the glacier surface (see pages 16 and 35).

HUBBARD GLACIER IS EVIDENTLY ON EVE OF GREAT MOVEMENT

In 1909, however, this moraine-covered land slope of the glacier margin was being destroyed; the ice was pushing out

BRAIDED STEAM COURSES WHICH EXPLORERS FIND DIFFICULT TO CROSS



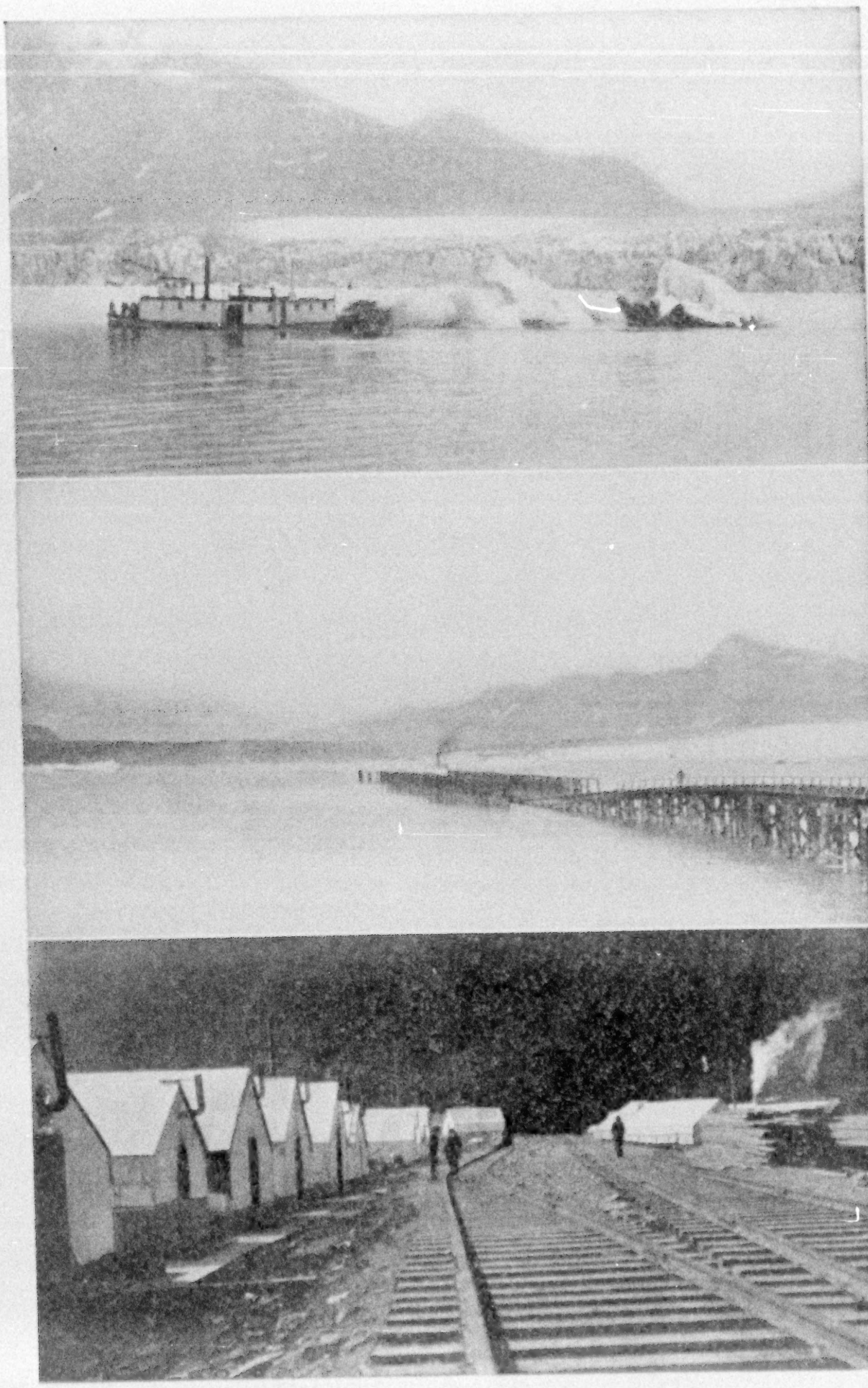
TRAVEL TO THE GLACIERS BY BOAT AMONG THE ICEBERGS AND OVER THE GLACIER SURFACES ON FOOT

THE AUTOMOBILE IN FRONT OF VALDEZ GLACIER (SEE PAGE 9)

through the moraine, and bare, steep, ice cliffs were developed in place of the former morainic slopes. The ice cliff was broken, and blocks of ice, dislodged, were falling to its base, while the moraine, in the grasp of running water liberated from the newly exposed ice, was being deposited on the mud flat at the base of the glacier, burying willow bushes and annual plants that had previously been growing there. From the sea cliff many icebergs were being discharged, proving still further that this margin of the glacier had begun to advance; but we could not be certain that the main part of the glacier was also moving forward more rapidly than before, although it seemed to us that the cliff was higher and there was more ice in the fiord, and more frequent discharge of icebergs than in 1905 and 1906.

From the condition of Hubbard glacier we conclude that an advance under the flood impulse had just begun in the summer of 1909, certainly along the eastern margin, and perhaps throughout the entire glacier. It would, therefore, be of great interest to return to it in 1910 to see exactly what change follows, for in this case we seem to have discovered a glacier showing the very first signs of advance. It will also be interesting to observe whether all or only a part of the glacier feels the flood impulse, for Hubbard glacier is made by the union of two very large tributaries, and each of these has large feeders. By the flood explanation it is not to be expected that glaciers of different lengths, with different numbers of tributaries, and with different conditions in their reservoirs, will advance at the same time.

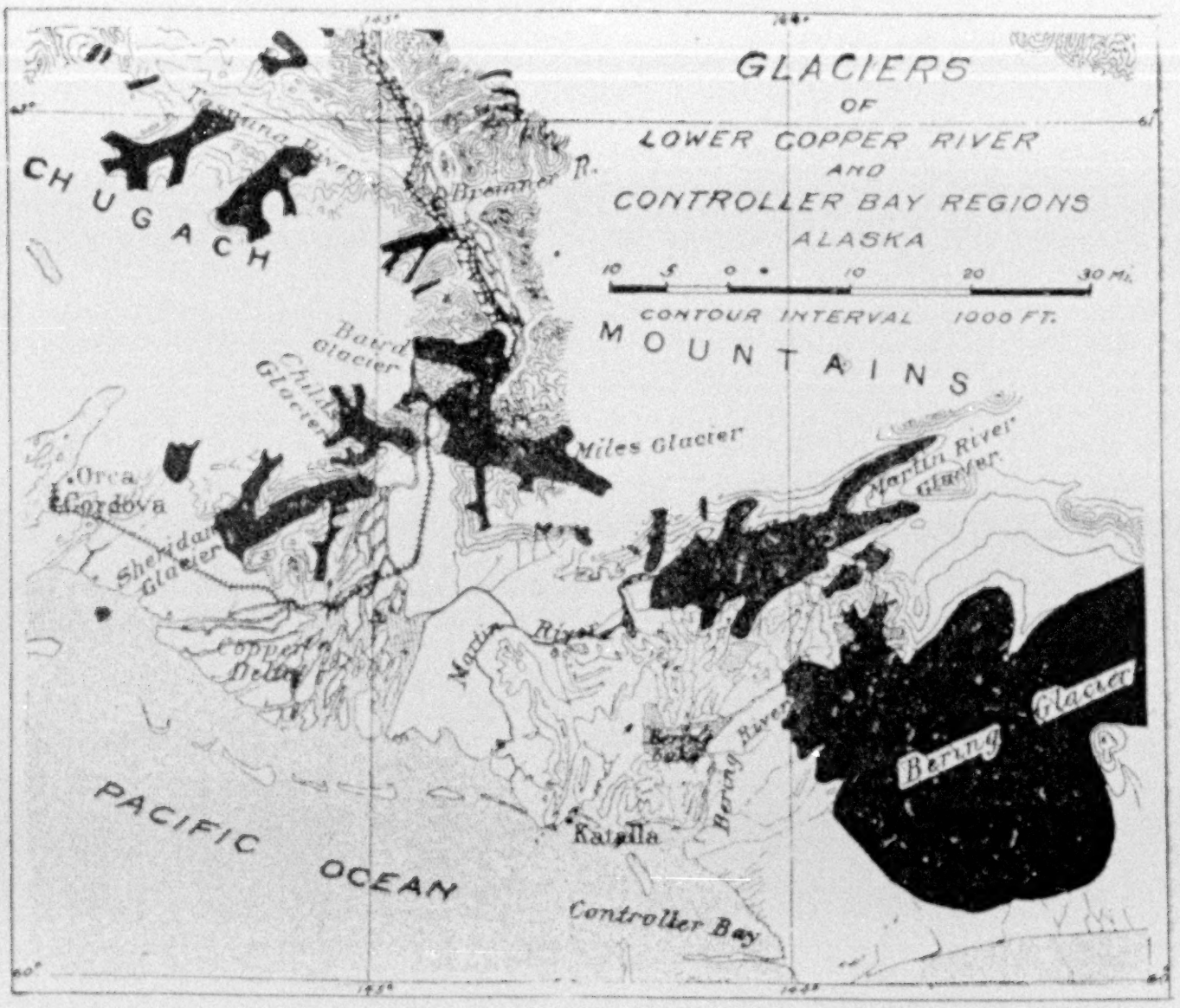
It is quite possible that the eastern side of Hubbard glacier will respond to the glacier flood at a different time and in a different amount than the western margin, which is supplied from an entirely different source. Indeed, even the same side may advance under the influence of the flood from some of its larger feeders, then halt, and later advance again under the flood impulse supplied from more re-



MILES GLACIER AND LAKE (SEE PAGE 13)

FERRY SLIP; STAGNANT PORTION OF MILES GLACIER ON LEFT

M. J. HENEY'S CONSTRUCTION CAMP 55, WITH TENT HOUSES



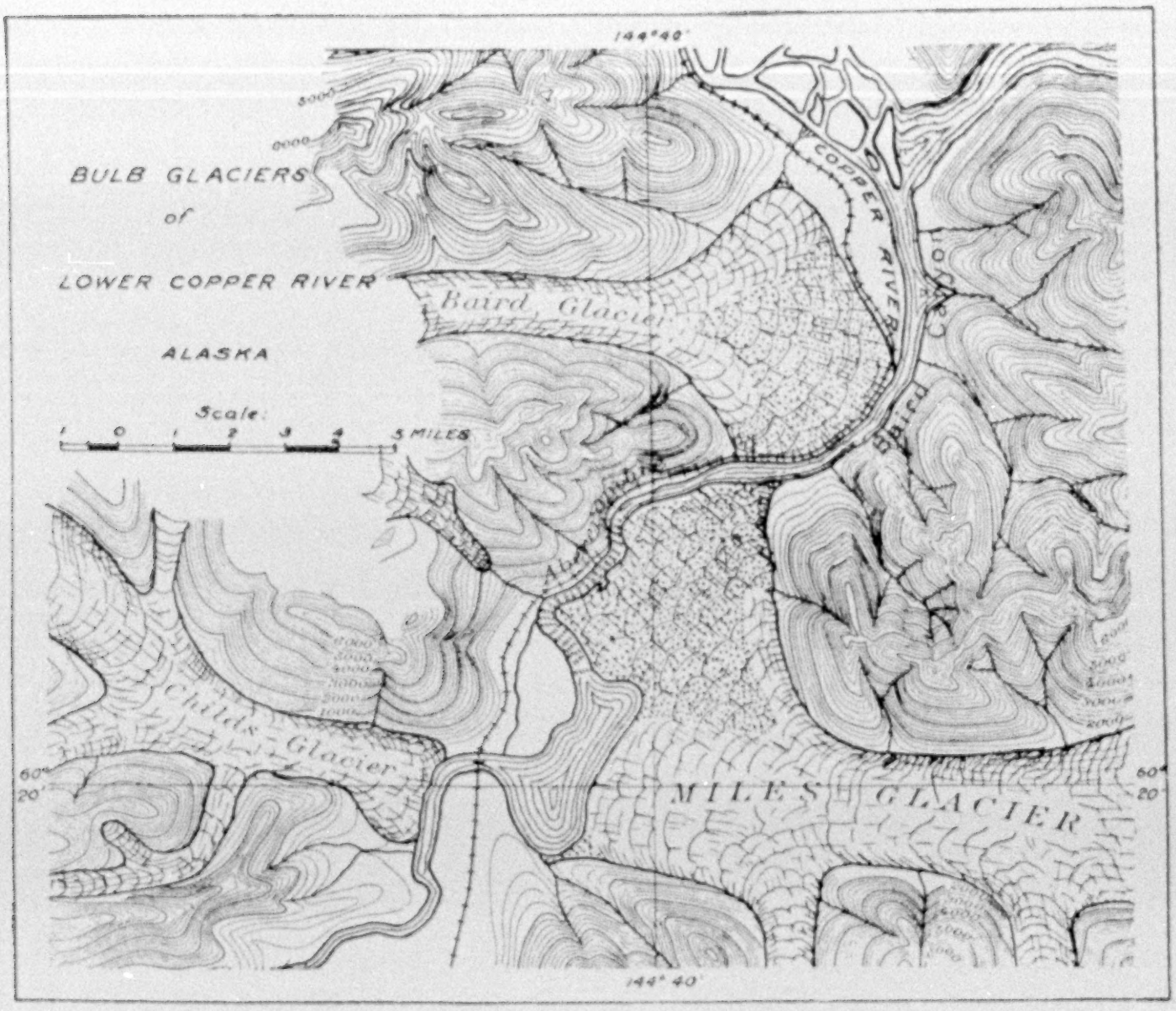
MAP OF PART OF ALASKAN COAST (AFTER U. S. GEOLOGICAL SURVEY)

Showing glaciers of lower Copper River. The water at the delta is so shallow that the terminus is at Cordova to the west. There are valuable coal fields between Bering and Martin River glaciers and rich copper deposits north of the Chugach Mountains (see pages 13 and 37).

mote reservoirs. The entire phenomenon of advancing glaciers as a result of earthquake shaking is so little known that it is difficult to accurately predict results, and consequently it is highly important to maintain observations so that this novel and interesting phenomenon may be more thoroughly understood.

LUCIA GLACIER HAD BECOME IMPASSABLE

The second glacier that has been brought under the flood impulse since last seen in 1906 is the Lucia glacier, which lies next west the Atrevida, and whose lower, stagnant end coalesces with the Atrevida glacier. The expedition of 1906 crossed the Lucia glacier from west to east in order to study the western margin of the Atrevida glacier, which had become so crevassed between 1905 and 1906 that it could no longer be crossed. The Lucia was then in the same condition as when crossed by the junior author in 1905 and by Professor Russell in 1890—that is, the Lucia glacier, fed by many tributaries, emerged from its mountain valley as a partly moraine-covered glacier, with so little crevassing that it could be easily traversed in any direction. Beyond the mountains it expanded into a piedmont bulb covered with moraine, and its outer margin was so stagnant that it was covered by a dense growth of alder and cottonwood. On the western side, near



THE COPPER RIVER AND NORTHWESTERN RAILWAY PASSING BETWEEN CHILDS AND MILES GLACIERS AND OVER THE STAGNANT ICE OF BAIRD GLACIER

Trains now cross the Miles Glacier Lake on a car ferry, pending completion of the bridge across Copper River. (Map after U. S. Geological Survey.) (See pages 13 and 37.)

Floral Pass, the glacier split against a rock hill, or semi-nunatak, sending a small tongue part way down the valley on the western side of the nunatak.

In 1909 the Lucia glacier was absolutely transformed. It was crevassed from side to side, so that the route to Floral Pass, so easily followed in 1890, 1905, and 1906, was no longer passable. The glacier was broken by great rents, enclosing table-topped areas of unbroken ice, on which the ablation moraine still stood, and along the margin, as well as within the mountain valley, was a maze of crevasses, seracs, and pinnacles, giving the ice surface the appearance of an ice fall, where but three years earlier one could walk in any direction with only an occasional crevasse to impede the journey. Along the eastern margin the breaking of the glacier was still in progress and the cracking of the ice and the falling of ice blocks was heard every few moments, while the moraine was all the time sliding down the ice face or into crevasses (p. 41).

Where in 1906 was a moderately sloping embankment of moraine-covered ice, up which we could easily climb at any point, there was in 1909 an ice precipice with jagged, serrated skyline, due to the recent breaking of the glacier. On the western margin, which we were unable to

visit, but saw from a distance, the ice had crowded up on the stoss side of the nunatak nearly to its top, while the distributary west of the nunatak had protruded entirely through its valley and was nearly, if not quite, united with the main glacier below the nunatak.

In the central part of the glacier the new-formed rents extended down into the previously nearly stagnant bulb, but not into the alder-covered zone. There the advance of the Lucia had not extended so far as that of the Atrevida in 1906, when the broken ice affected even a part of the alder zone of its piedmont bulb. But it seems probable that the advance of Lucia glacier, which was certainly in progress in the summer of 1909, was not as far advanced as that of the Atrevida in 1906. As will be seen from the descriptions which follow, the flood impulse is rapid and soon dies out. Quite probably the flood of the Lucia will have attained its height by 1910.

REMARKABLE TRANSFORMATION OF HIDDEN GLACIER

While the Hubbard glacier is apparently in a very early stage of advance, and Lucia glacier has not yet reached the maximum of its flood stage, the Hidden glacier has entered upon and completely passed through flood condition in the interval between 1906 and 1909. In late June, 1906, the Hidden glacier was seen and photographed from near the sea, but it was then so like its condition in 1905 that it was not studied further; but in 1905, because of certain interesting phenomena, it was studied carefully, and photographed from various points. It was then, and in 1906 still was, a low grade, smooth-surfaced glacier, almost, if not quite, stagnant, ending in a gently-sloping front, quite free from débris, over which one could easily travel in all directions. The ice front lay about 2 miles from the sea, and in the interval between Gilbert and Gannett's visit in 1899 and ours in 1905 it had receded about a quarter of a mile. Beyond the apparent front of the glacier, between it and the sea, lay a pitted gravel plain, partly resting on stagnant ice still connected with the glacier. Altogether the Hidden glacier was so perfect a type of an inactive valley glacier in a waning state that one would never have thought of predicting for it a sudden change to activity and complete transformation to a broken condition. Yet that is exactly what happened immediately after it was last seen in 1906, and possibly even late in that year (see pages 42–43).

Notwithstanding the almost magical transformation of glaciers to which we had by that time become accustomed, our astonishment was so great as almost to make us disbelieve our own senses when Hidden glacier burst upon our view in July, 1909. Russell called this Hidden glacier because, as he sailed up Russell Fiord, it was almost hidden from view, appearing for only a short time as its valley opened, revealing the glacier nestled between the steep mountain walls over 2 miles from the sea. As we rounded the northern wall of the valley in July, 1909, the glacier burst upon our view so high and so near that we at first thought it tidal. As a matter of fact, its front was still a quarter of a mile from the sea, but it was nearly 2 miles farther down its valley than in 1905 and 1906, and higher and steeper than the front then was. It had advanced over all of our bench-marks and important photographic sites which we had located primarily for the purpose of recording future recession. The most important of our sites was beneath 500 feet of ice and in front of it stretched 2 miles of glacier.

Not only had the glacier advanced, but it had become profoundly crevassed. However, the advance had occurred so long ago that ablation had healed much of the crevassing, making it possible for us to travel over parts of the glacier surface, though only when the party was roped together, and then by the use of much care, and with many detours around yawning crevasses. The glacier surface was far different from the smooth state of 1905 and 1906. It was a tumultuous series of great swells and troughs, with abundant crevasses, in spite of the pronounced

A SHARP CURVE IN THE RAILWAY AT ABERCROMBIE RAPIDS; A NARROW SHELF BLASTED OUT FOR THE ROAD

THE COPPER RIVER AND NORTHWESTERN RAILWAY UNDER CONSTRUCTION ON THE STAGNANT ICE OF BAIRD GLACIER (SEE PAGES 13-14)

Copper River on one side, ice beneath, glacial ice with moraine and forest on the other side

THE RAILWAY AUTOMOBILE AND MR WILLIAMS, ASSISTANT ENGINEER OF THE RAILWAY

Forest-covered Baird glacier in the background. The leaders of the National Geographic Society's Expedition traveled 125 miles in the car, through the courtesy of the Katalla Company, who are building the railway, and Messrs Hawkins and Williams.

ablation which had evidently been in progress since the glacier spasmodically rushed forward. So much ablation had taken place that we are certain that the advance occurred at least as early as 1907 and perhaps in 1906. The advance must have been rapid, occupying only a small period of time, for, at most, there were only three years for the advance, breaking, and partial healing by ablation, to a state permitting travel over the surface. It is a pity that there was no one at hand to witness the beginning and progress of this marvelous change in glacier condition, the most spectacular of all so far recorded in the Yakutat Bay region, or, for that matter, in all the world.

PRESENT CONDITION OF THE GLACIERS THAT ADVANCED IN 1906

Our second principal line of inquiry was with reference to the condition of the four glaciers whose remarkable advance was discovered in 1906. In the summer of that year the Variegated, Haenke, Atrevida, and Marvine glaciers were in a state of activity which contrasted strikingly with their inactive condition nine months before. The observations of 1906 were upon glaciers in full flood stage, and if, as proposed by the theory, this spasmodic transportation was the result of an impulse due to the accession of large quantities of snow and ice shaken down into the reservoir in a period of three weeks of earthquake shaking, it was to be expected that the full force of the advance would soon be spent.

It was, therefore, with great interest that we returned to an examination of the transformed glaciers. Our expectations were more than realized, for we were quite as unprepared for so sudden a cessation of activity as we had been for the spasmodic advance and breaking observed in 1906. From our study in 1909 it has become evident that the advance of the glaciers, begun between September, 1905, and June, 1906, ended before the summer of 1907. By this it is not meant to assert

that *all* forward motion ceased thus abruptly, though this also may have been true, but merely that the rapid movement which broke the surface of the glaciers into impassable condition came to an end at least as early as the beginning of the summer of 1907, and that the spasmodic advance, from beginning to end, was accomplished within a period of not over one year.

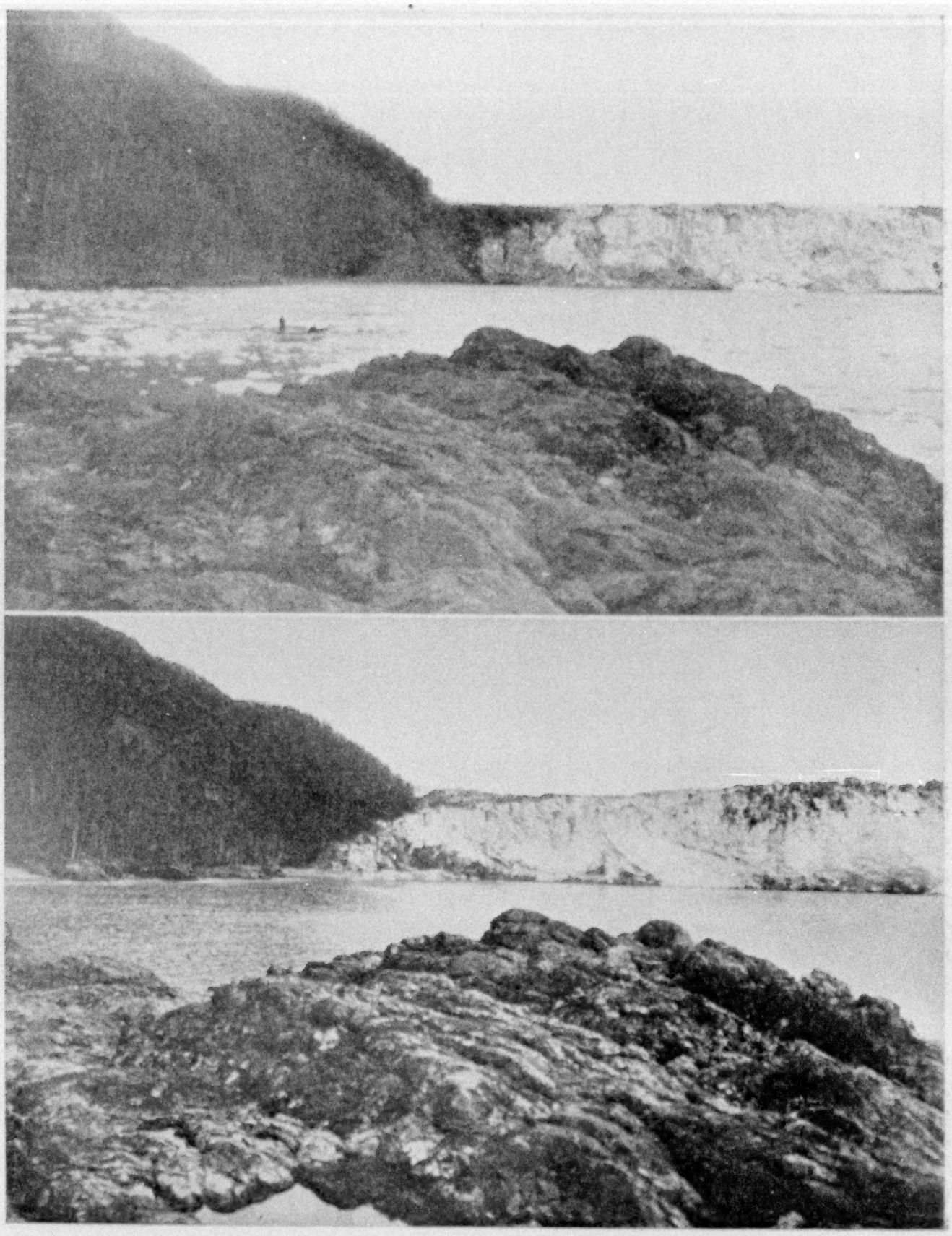
The evidence of this almost incredibly rapid change from stagnation to great activity, and then back again to stagnation, is clear and convincing, though in an article of this length it cannot be discussed with sufficient fullness to marshal all the proof. The proofs of the abrupt advance have already been stated in this paper, as well as much more fully in other publications relating to the studies of earlier years. That the advance so actively in progress in the summer of 1906 did not extend into the summer of 1907, is suggested by the extent to which ablation has healed the crevassing caused by the spasmodic advance. The ice surfaces upon which we could not travel at all in 1906 were again passable in 1909.

We walked across the lower end of the Variegated glacier, and crossed the Atrevida glacier to Terrace Point, and although we did not go to them, it was evident that both the Haenke glacier and the eastern, or Marvine, lobe of the Malaspina glacier could be traversed without great difficulty. For ablation to so heal the broken ice surface as to permit travel over it time is required, and it is inconceivable that the single season of 1907 was sufficient for this extensive ablation. In the period of time required must certainly be included the summer of 1907. Contributory evidence is supplied by Hidden glacier, whose entire advance and ablation to passable condition took place after June, 1906; but travel over this glacier is more difficult than over those glaciers which advanced early in 1906, for there has been less time available for the reduction of the roughened surface by ablation.

Other more definite proof that the advance ceased within a few months after our study of 1906 is furnished by each of the glaciers. The front of the advancing portion of Variegated glacier has gone no farther than where it stood when last seen in 1906; Haenke glacier front is not quite so far out now as then; the eastern margin of Atrevida glacier advanced a little further, but the extent of breaking out in the alder-covered stagnant bulb is the same as in 1906, even the same rings of broken ice in the alder thicket being present; and along the eastern margin of Malaspina glacier the forest growth on the ablation moraine of the stagnant ice was not entirely destroyed, although in the summer of 1906 it was disappearing at a rapid rate.

In a word, although the change in glacier condition between September, 1905, and June, 1906, was marvelous in these four glaciers, the changes between August, 1906, and July, 1909, have been of almost no consequence, excepting only such extensive ablation as to render the glaciers once more passable. It is not to be inferred, however, that ablation has so reduced the irregularities caused by the breaking of the glaciers in their flood stage as to bring about again the undulating, easily traversible surfaces of 1905. The condition of the glacier surfaces is far different from that of the period before the advance, and travel over them is as yet by no means easy. The surface rises and falls in a series of great waves and troughs, and crevasses are encountered at frequent intervals. Nevertheless, the ice surface of these glaciers more closely resembles the condition of 1905 than that of 1906. It is evident that they have once more relapsed into the stagnant or semi-stagnant state by which they have been characterized since first discovered and studied.

The observations of 1906 proved that the advance of the glaciers under the impulse of increased supply furnished by earthquake shaking was rapid, and the observations of 1909 prove that the impulse is spasmodic and of brief duration. The entire cycle, from gently undulating ice surface, through the broken stage of the glacier flood, and back to the normal

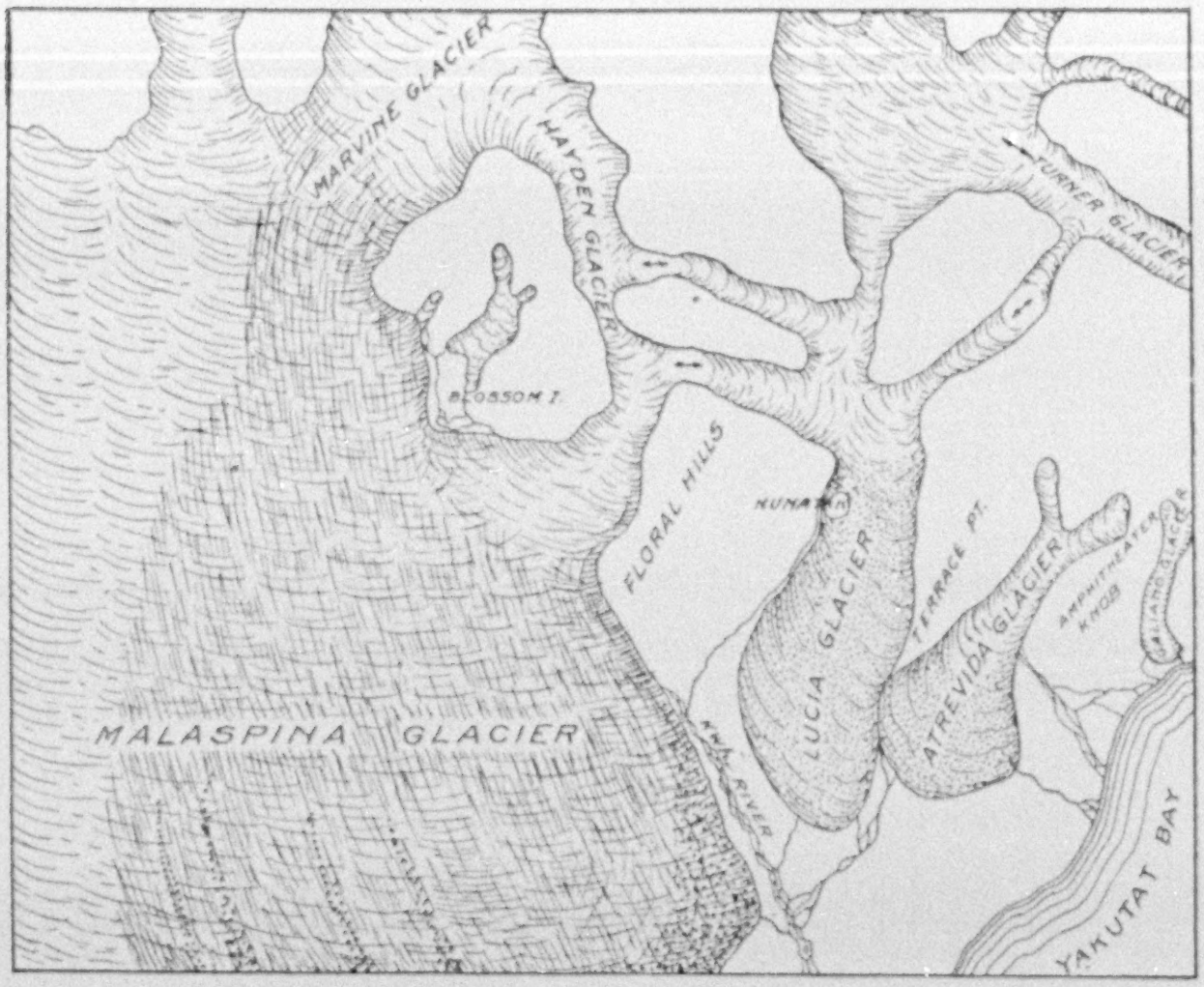


WEST MARGIN OF COLUMBIA GLACIER, AS PHOTOGRAPHED BY GILBERT IN 1899 AND BY THE NATIONAL GEOGRAPHIC SOCIETY'S EXPEDITION IN 1909, AFTER THE RECENT ADVANCE (SEE PAGE 37)

EAST SIDE OF COLUMBIA GLACIER, PHOTOGRAPHED IN 1909 FROM EXACT SITE UTILIZED BY GILBERT TEN YEARS BEFORE: ADVANCE SHOWN IN LOWER PHOTOGRAPH

COLUMBIA GLACIER ADVANCING INTO FOREST, OVERTURNING TREES AND SHOVING UP A MORAINE (SEE PAGES 9–13, AND 37)

ICE OF COLUMBIA GLACIER OVERTURNING MATURE FOREST



ATREVIDA, LUCIA, AND MARVINE LOBE OF MALASPINA GLACIER

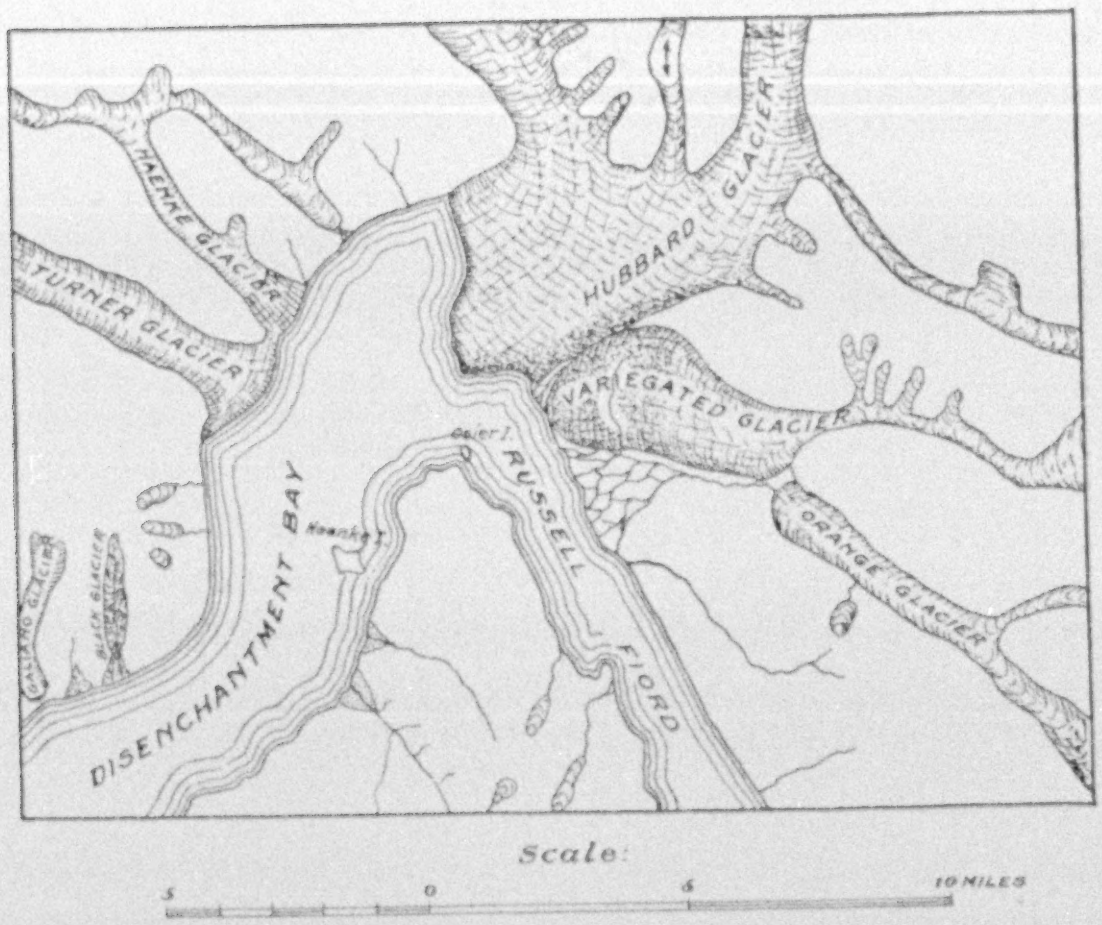
Atrevida and Malaspina glaciers advanced between 1905 and 1906, while Lucia glacier was advancing in 1909 (see pages 17, 24 and 25)

condition of the stagnant glacier, is compassed in a period of but a few years, say from four to six years. Surely the term glacier flood is warranted for such a sudden change in ice condition.

This is not the place for a discussion of the validity of the earthquake theory for these remarkable changes, but it may, nevertheless, be pointed out here that, while this theory accounts for all the facts, and stands all the tests applied to it, no other explanation that has so far been suggested can be considered even rational enough to be retained as an alternate hypothesis. We believe, therefore, that we are warranted in claiming that a new cause for glacier advance has been discovered, for the theory of advance under earthquake impulse, first put forward by the senior author as a result of his observations of 1906, has, by the additional evidence discovered in 1909, been put to such tests as to completely verify it.

GLACIERS OF OTHER SECTIONS SHOW NO EVIDENCE OF SPASMODIC ADVANCE DUE TO 1899 EARTHQUAKES

There is, however, one further test that we were able to apply as a result of the field work of the 1909 expedition. It has seemed to us reasonable to expect that, since the earthquakes of September, 1899, were centered in and about the Yakutat Bay region, the spasmodic advance of glaciers should be confined to that region, or, at least, should not be



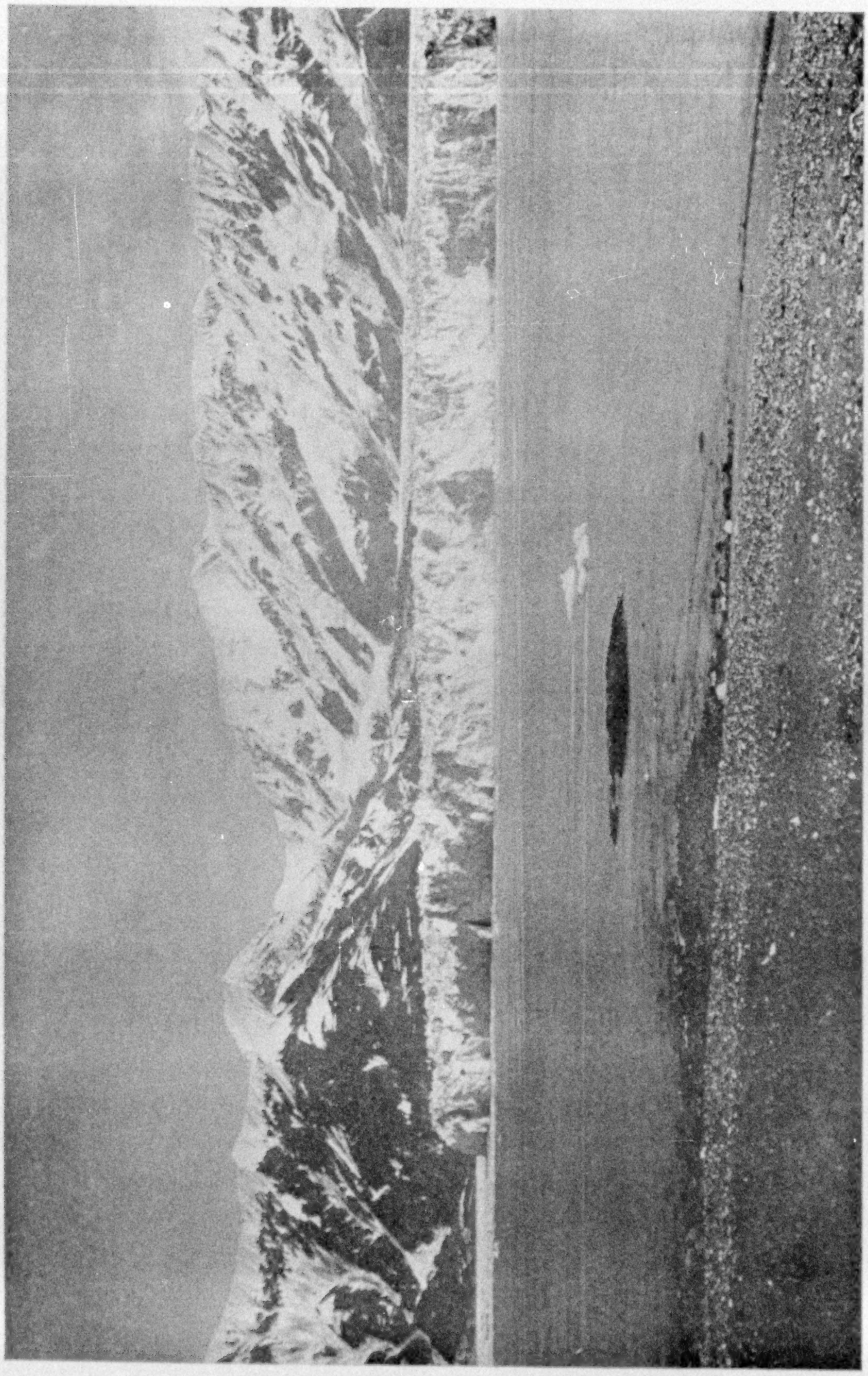
VARIEGATED AND HAENKE GLACIERS

Which were stagnant and easy to cross in 1905, crevassed and impassable in 1906, and stagnant and passable in 1909. Hubbard glacier, perhaps, began an advance in 1909 (see pages 16, 17, 19 and 22).

noticed far to one side of the area of vigorous shaking. Just what is to be expected near the periphery of the area of maximum shaking we are not in a position to predict, though it is to be expected that there, also, some response, probably less spectacular, should occur. In a single field season we could not, of course, cover an extensive area in personal field work, but we were able to do some work in the Prince William Sound region and in the Copper River Valley, and we made some observations on glaciers visible from the steamer and made inquiries regarding them.

So far as we could learn from our inquiries none of the glaciers of the Inside Passage have undergone any notable transformation since 1899, excepting that of recession as exemplified especially in the Muir glacier. The Brady glacier, near which our ship anchored for the night, has not changed notably since 1905, when we last saw it, and we could not detect any changes in the great glaciers which descend the western face of the Fairweather Range, although it should be stated that most of these were seen from such a distance that we could have detected only extensive changes. These glaciers, together with the Brady, Muir, and others in this vicinty, are within the area shaken during the September, 1899, earthquakes and may be expected to respond, to some extent at least, to the effects of this shaking.

The natives residing at Dry Bay, 60 miles southeast of Yakutat Bay, report that in the summer of 1909 there were remarkable and long-continued changes in the volume of the Alsek River, which may be related to the advancing and breaking of some of the glaciers whose ends lie up this valley. We may expect advance in these glaciers, for their sources lie in the snow fields of mountains within the area of vigorous shaking during the 1899 earthquakes.



THE HUBBARD GLACIER IN 1909 FROM OSIER ISLAND

Our actual field work on areas outside of the Yakutat Bay region was entirely to the northwest. Here, in Prince William Sound, we found the large Valdez glacier continuing the recession which has been in progress, with one possible slight advance, since 1899. There has also been a retreat since 1898 of the Shoup glacier, which, however, is smaller than the Valdez. On the other hand, the still larger Columbia glacier, the greatest in this region, and comparable to the Hubbard, was again advancing into the forest in 1909, as it had seven years before 1899, when studied by Dr Gilbert. Prof. U. S. Grant has shown that there was a period of recession in the Columbia glacier between 1899 and 1905, followed by slight advance between 1905 and 1908. The present advance, which has gone beyond that of 1892, does not appear to be of the same order as that of those Yakutat Bay glaciers which are advancing under the impulse of earthquake shaking. It may be the beginning of a spasmodic movement, or it may be a slow forward swing such as comes from moderate variation in snow supply. Moreover, we would hardly expect the largest glacier to be the first to advance under the earthquake influence. However, it will be important to watch this glacier in the next few years (pp. 30–33).

In the Copper River Valley, although several other glaciers were seen, and showed no sign of recent notable advance, we gave special attention to the three largest, the Baird, the Miles, and the Childs. That the Baird glacier has long been stagnant is proved by its moraine-covered piedmont bulb, bearing a growth of mature alder (see pages 24–25).

The Miles glacier is more active and discharges icebergs into the Copper River from a long ice cliff; but its alder-bearing, moraine-covered piedmont bulb on the north side shows a long period free from advance, photographs and maps by Abercrombie in 1884, Allen in 1885, Hayes in 1891, and Schrader in 1900 verifying this inactivity.

The Childs glacier, which is also actively discharging icebergs into the Copper River directly opposite the Miles, has not recently been much farther out than now, but it is reported by the engineers of the Katalla Company, who are building the Copper River Railway, to be more active in 1909 than previously, and to have advanced somewhat.

In view of the great economic importance of these three glaciers, between two of which, and *on* one, the Copper River Railway is now built, it is of high importance that these three glaciers be carefully mapped and studied. The fate of the railway to the copper fields depends upon the behavior of these three glaciers, and since they are now so easily accessible and so interesting—the only case in the world where two large iceberg-discharging glaciers can be seen from a railway train which passes between them—they are likely to be much visited in the immediate future.

From our observations and inquiries of 1909 we are led to believe that the spasmodic advance of glaciers, so vividly illustrated by six of the glaciers in the small area of Yakutat Bay, has probably not been duplicated in the regions to the northwest and southeast. It is, of course, recognized that such negative evidence is not wholly conclusive, since our observations have not included all the glaciers or even a large proportion of them. But it is, nevertheless, considered as contributory evidence that in our search to the northwest and southeast of the Yakutat Bay region we have so far failed to find a duplication of the marvelous transformation of glaciers observed there. So far as it goes, this evidence tends to verify the theory of local cause for glacier advance in Yakutat Bay. Further study in the areas beyond the limit of vigorous shaking by the 1899 earthquakes should be expected to bear similar testimony.

There have been world-shaking earthquakes originating near the Prince William Sound and Copper River regions, of which those of October 9, 1900, and February 14, 1908, are good examples, though less severe than the three weeks of earthquakes at Yakutat Bay in Sep-

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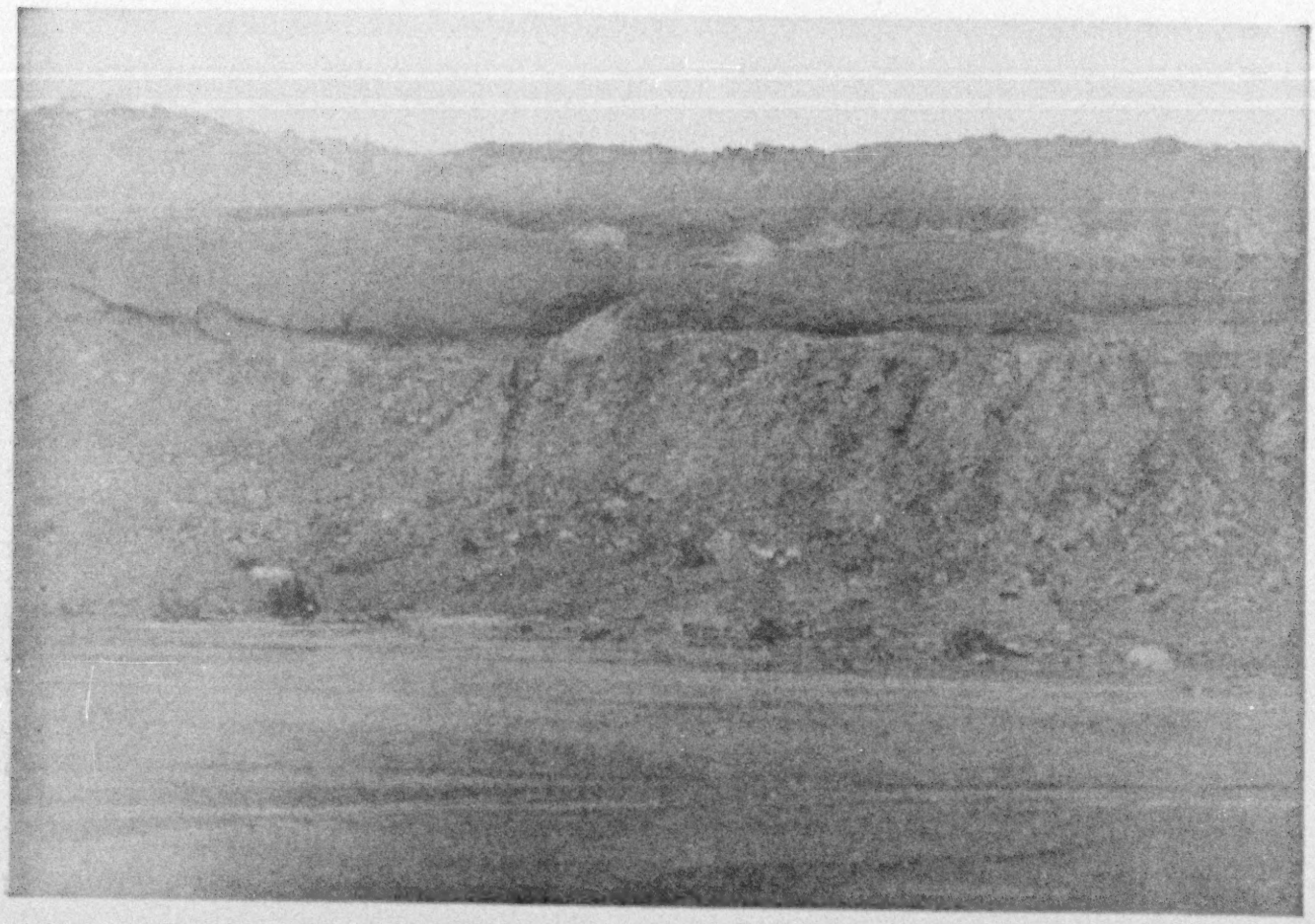


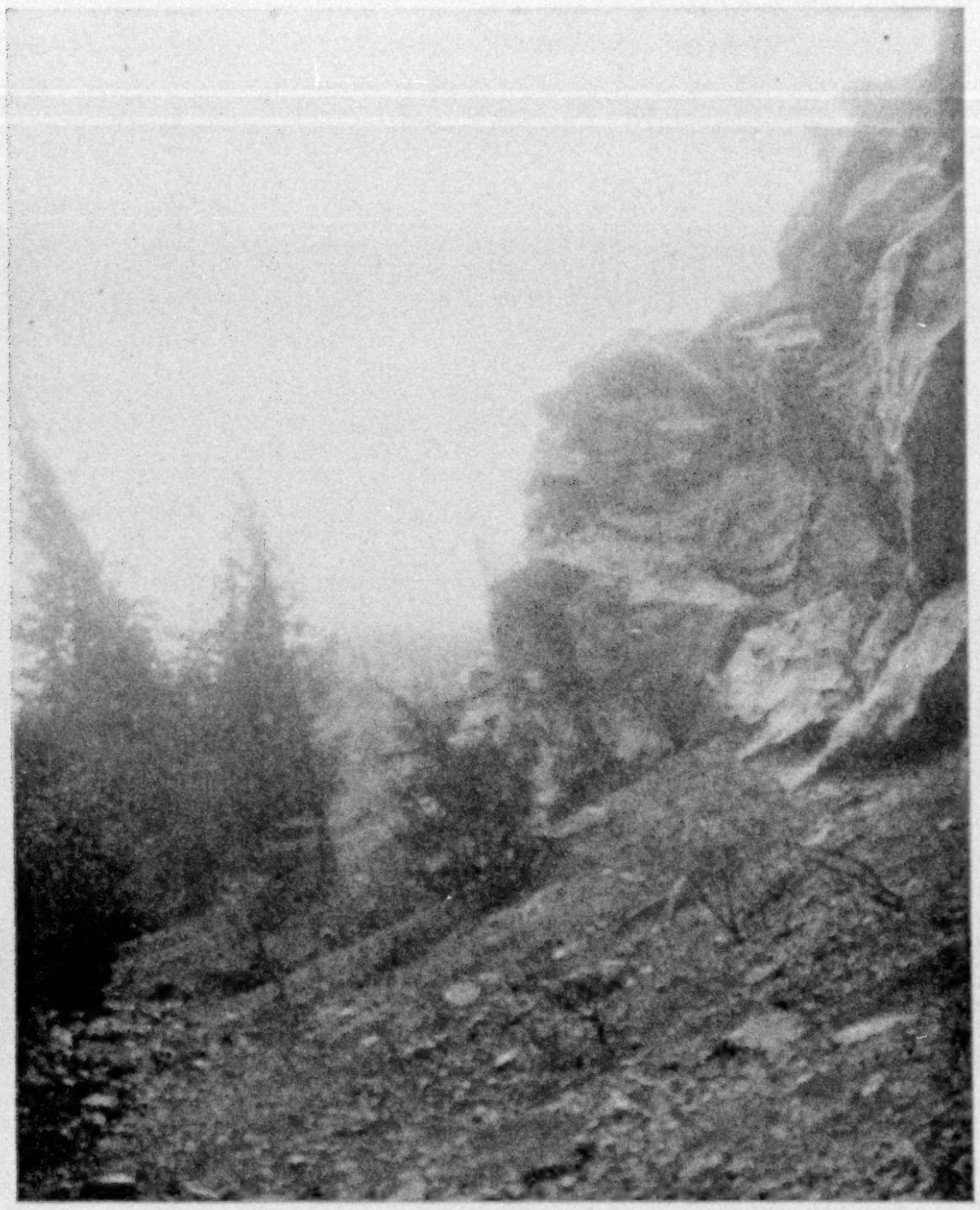
MORAINE-VENEERED EAST MARGIN OF HUBBARD GLACIER IN 1909
Showing dark-colored ice projecting through moraine, as if glacier were about to advance

tember, 1899. Avalanches accompanied these shocks also. These facts may complicate the situation somewhat.

OTHER RESULTS OF THE NATIONAL GEOGRAPHIC SOCIETY'S 1909 EXPEDITION

The problems connected with the remarkable changes in the Yakutat Bay glaciers, and with the explanation of these changes, have claimed first attention from the authors, for these seemed to be the most inviting and important phases of work on Alaskan glaciers at present open to the student. It scarcely requires statement, however, that other problems also received attention of students of glaciers and glaciation whose good fortune it was to be given the opportunity to study in a field so rich in glacial phenomena as that of the Alaskan coast. This is not the place for a full statement of the results of our summer's work; that must be deferred until the appearance of our final report. Still a summary of some of the more important phases of these other results may appropriately be introduced here.

The Alaskan Coast region is not only the seat of the largest glaciers on the continent, and in fact of some of the largest in the world, outside of the Arctic and Antarctic regions, but also of some of the most interesting and least known. Therefore any study of these glaciers promises important results, and studies of one year will serve as a basis for future comparative studies. From this latter standpoint it has seemed to us highly important not only to provide descriptions of glaciers, but also to prepare maps of such detail as to give an accurate basis for future comparative study. Accordingly, the topograhper of the expedition, Mr W. B. Lewis, whom the U. S. Geological Survey detailed for this work, assisted by Mr E. F. Bean, has made a series of detailed contour maps of the principal glaciers studied. These will be published with our final report. Supplementary to maps, photographs from

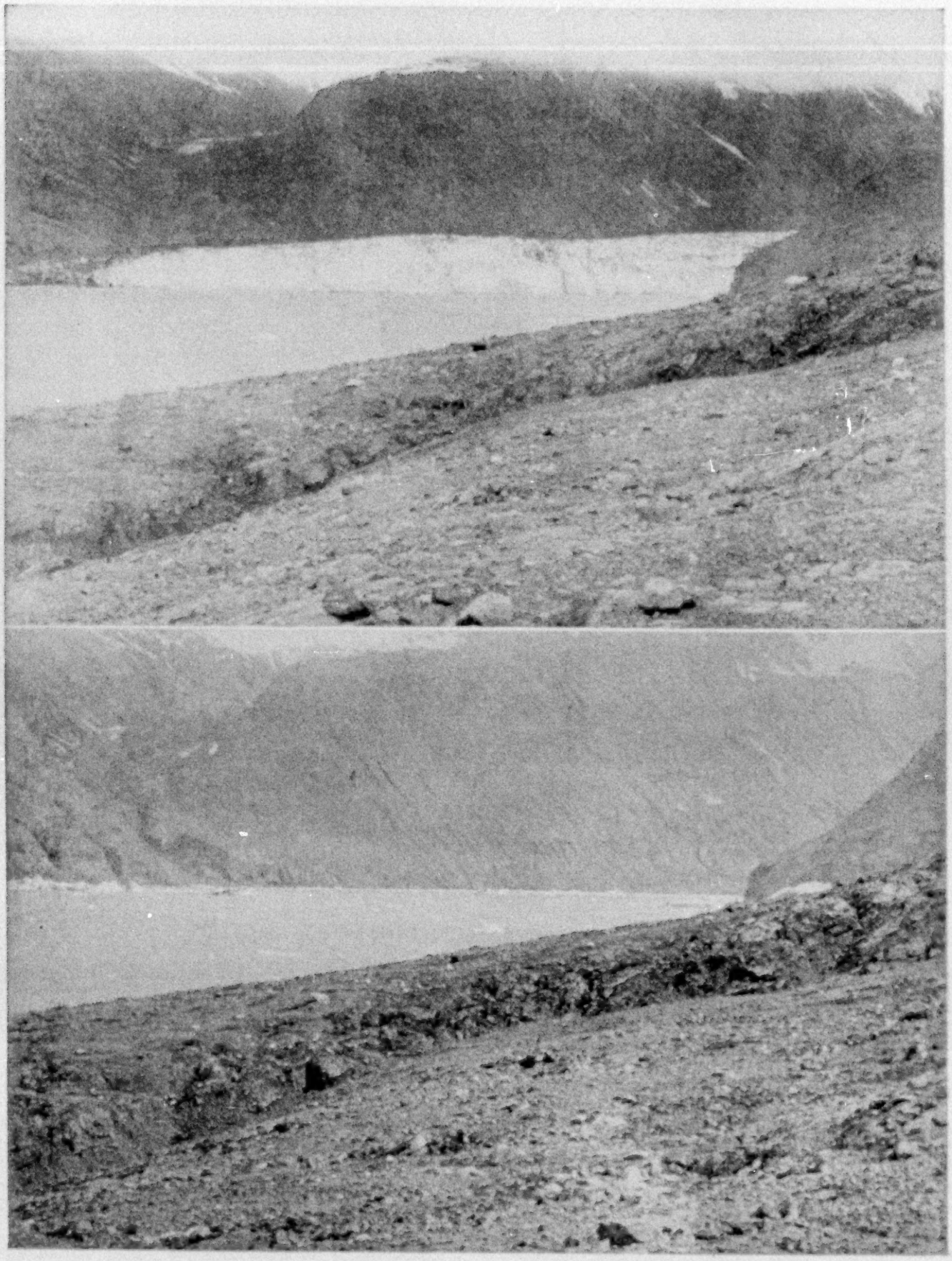


THE ADVANCING MARGIN OF ATREVIDA GLACIER BROKEN BY RECENT FORWARD MOTION

In 1905 this was a moderately sloping, moraine-covered ice margin; in 1906 it was a jagged cliff from which blocks of ice and stones were constantly falling into the forest, which was being overwhelmed (see pages 17 and 29).

selected points, which can again be occupied, are of high importance. The expedition was fortunate in having the services of Mr O. D. von Engeln, a skilled photographer trained also in physiography, to the results of whose work we are much indebted; and his photographs taken during this expedition as well as those which he took on the expedition of 1906 will be of great value in all future work on these glaciers. To these three men the authors are especially indebted for careful, conscientious work in their fields, as well as for generous assistance whenever and wherever needed. All future students in these fields will profit from their excellent work.

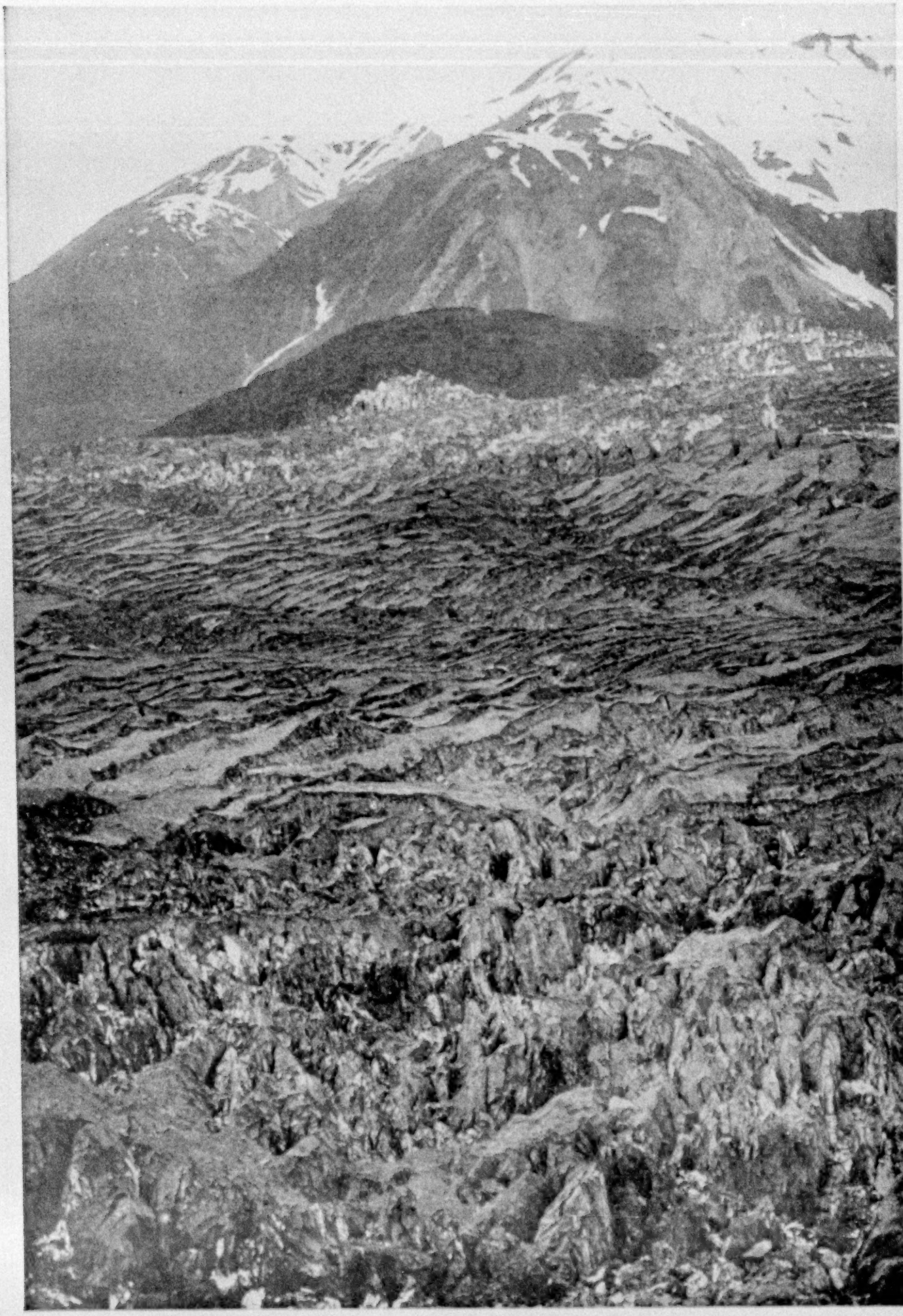
The glaciers of the Alaskan coast are especially interesting to the student of continental glaciation because here large masses of ice descend into a cool, damp, temperate climate, much as was the case at the base of the Alps and other mountains during the Glacial period. The wasting margins of these glaciers furnish much information of value in the study and interpretation of the phenomena of continental glaciation in Europe and



NUNATAK GLACIER IN 1899 (PHOTOGRAPHED BY G. K. GILBERT)

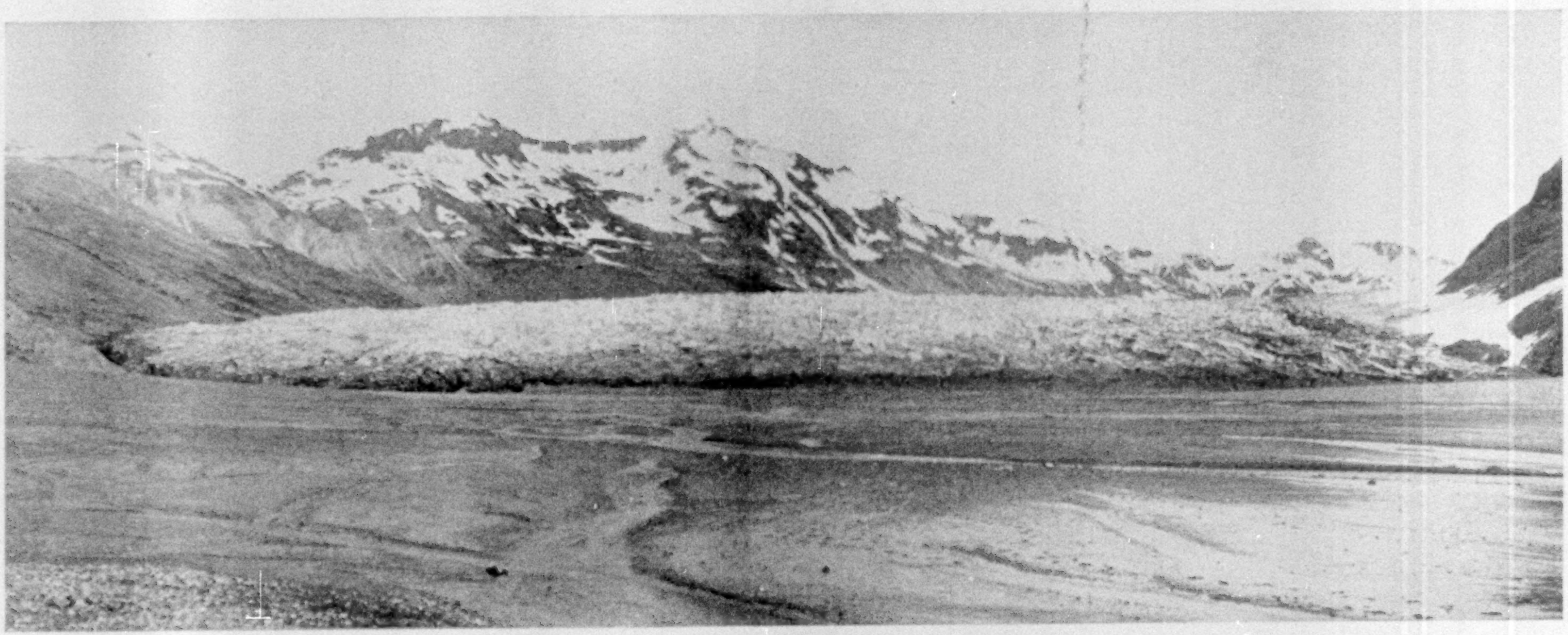
NUNATAK GLACIER TEN YEARS LATER

Photograph by the National Geographic Society's Expedition from exactly same site, glacier having retreated out of sight (see pages 8 and 44)



LUCIA GLACIER IN 1909 FROM TERRACE POINT

It is crevassed and moving rapidly. In 1890, 1905, and 1906 it was stagnant and without crevasses. The nunatak in the background is being overridden (see pages 24-25)



VIEW OF HIDDEN GLACIER IN 1909, TAKEN FROM SAME POINT AS THE PICTURE SHOWN ON PAGE 43 (SEE PAGE 26)

HIDDEN GLACIER IN 1906

This photograph was taken from the same point as the view of Hidden glacier in 1909, given on page 42. The glacier has advanced nearly two miles in three years

America. In our expedition especial study was made of the piedmont ice bulbs into which so many of the glaciers expand on emergence from their mountain valleys; and in this connection the ablation moraines which accumulate on the wasting surfaces of the stagnant piedmont ice masses, and the deposits accumulating around their margins, were given particular attention. A statement of the results of these studies must for the present be postponed.

Another line of inquiry to which attention was given was the cause of glacier motion, upon which the advancing glaciers throw light. The sudden forward movement of a glacier, such as observed in Yakutat Bay, is difficult to explain on the basis of some of the current hypotheses for glacial motion. On the hypothesis of plastic or viscous flowage, on the other hand, the phenomena are all easily explained. A number of facts of observation in the summer of 1906 and 1909 tend toward the verification of this hypothesis. The discussion of this subject must also be left for our final report.

Other problems which will be discussed in the full report deal with questions relating to the former extension of the glaciers. During the period of maximum glaciation, ice filled the entire Yakutat Bay inlet and discharged icebergs into the Pacific; and at the same time the Copper River Valley was filled, and ice occupied the entire Prince William Sound, at least on the eastern side to which our studies were confined. The erosive work performed by these great glaciers has, in part, shaped the various inlets and valleys, while their deposits have left records of considerable scientific interest.

In view of the fact that only two parts of the coast have so far been studied, it will not, of course, be possible to enter into a comparative study of the phenomena of former glaciation of all

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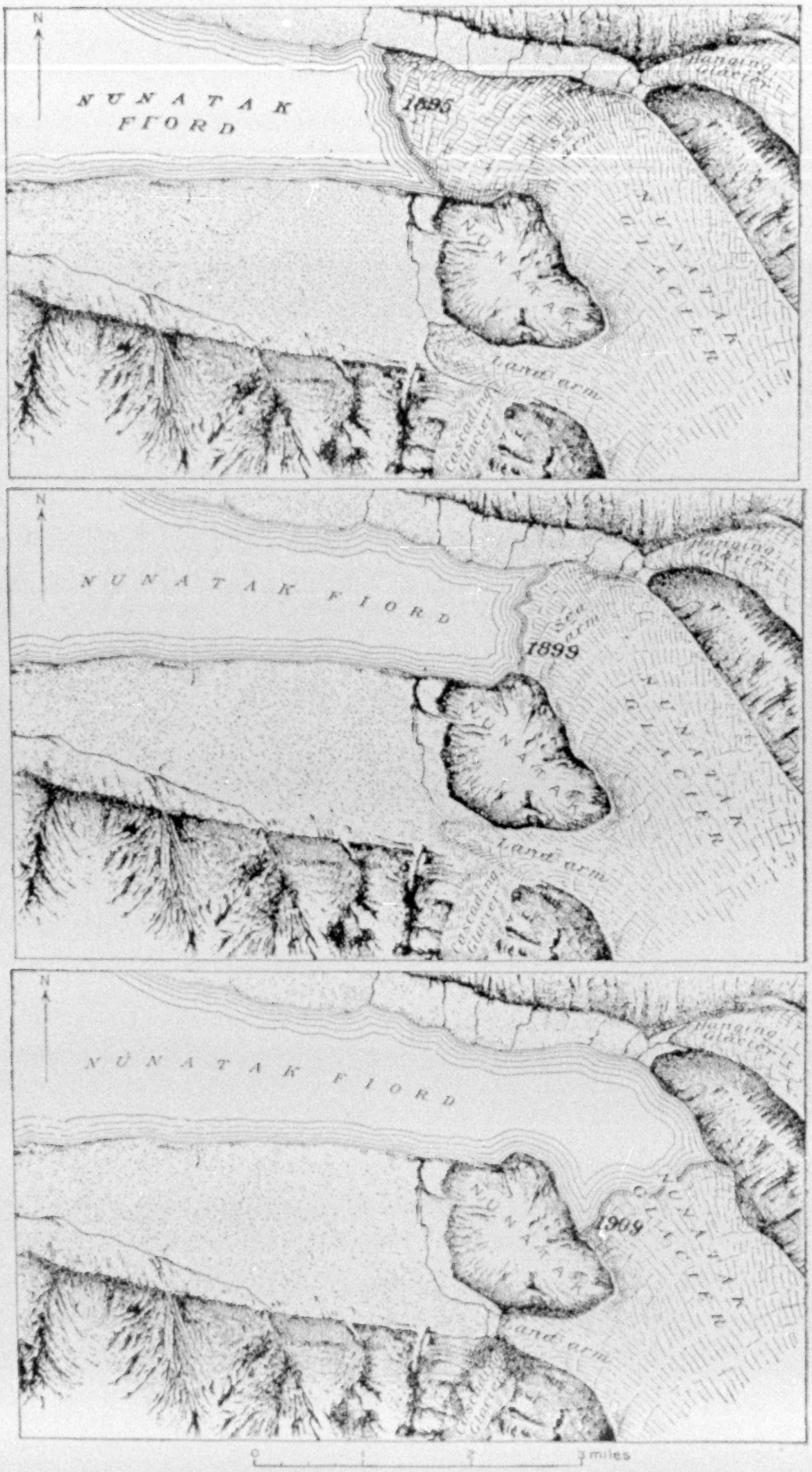
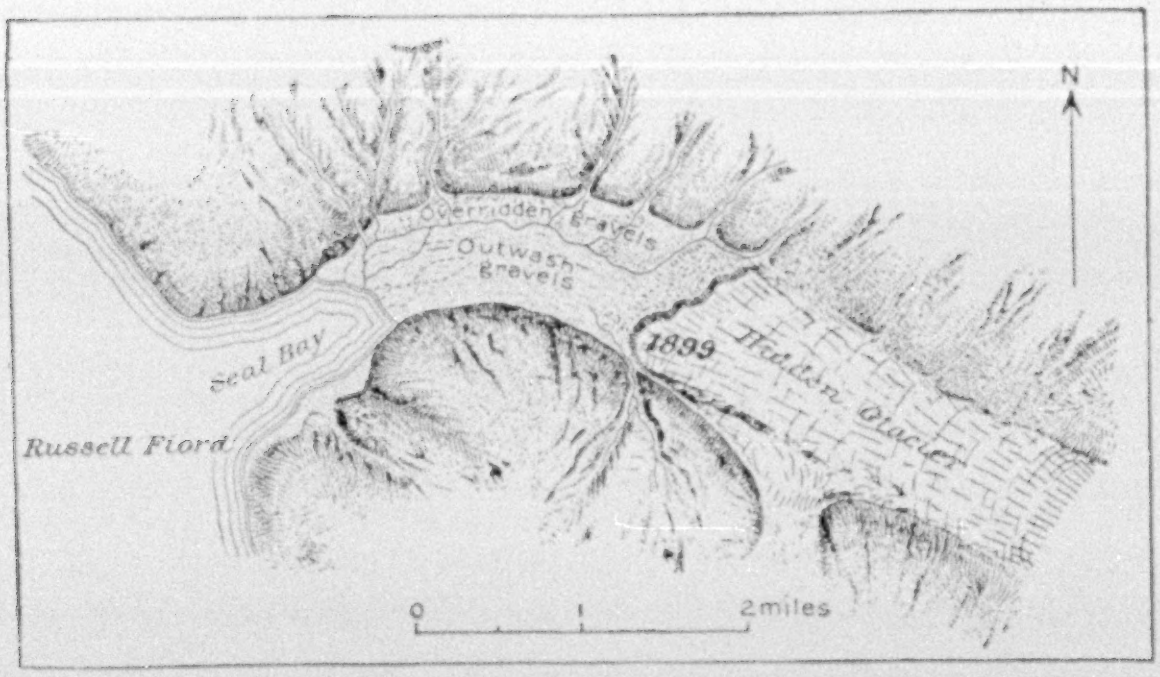
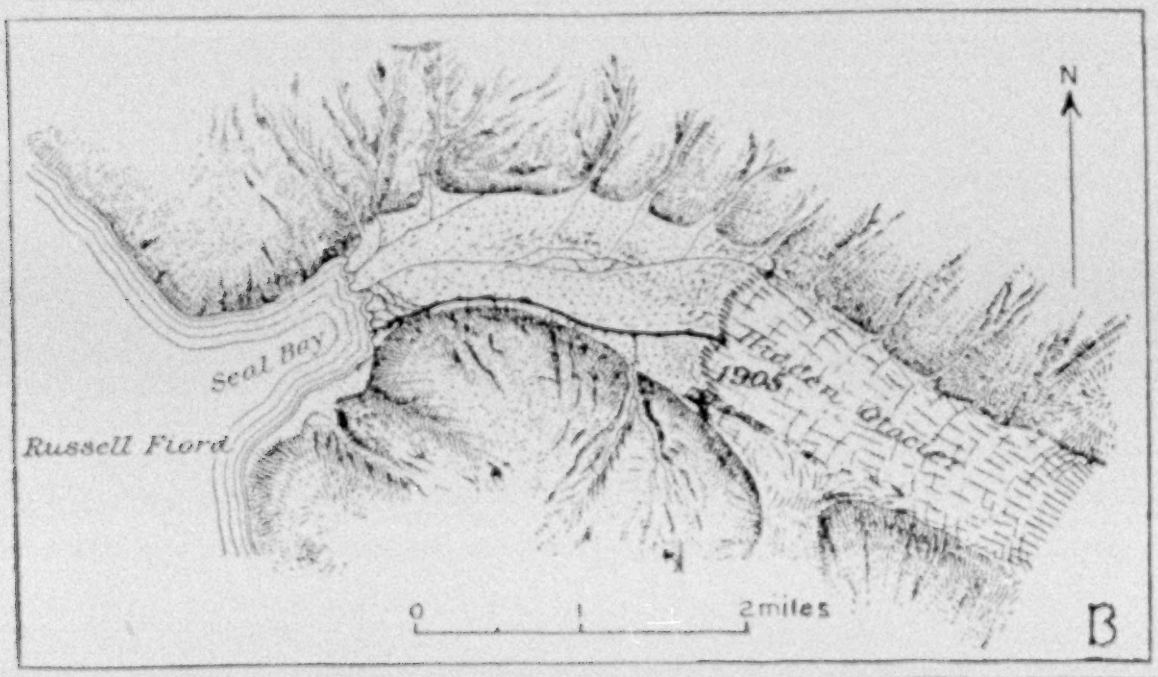
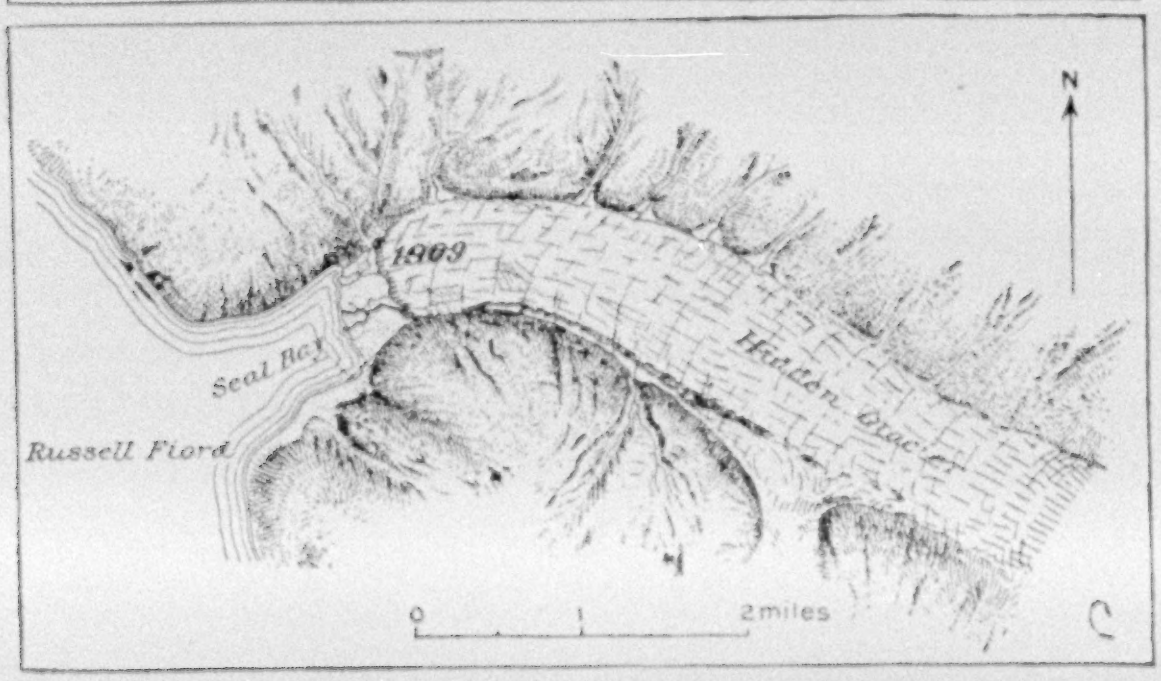


NUNATAK GLACIER IN 1895, 1899, AND 1909 (TOPOGRAPHY AFTER GANNETT)

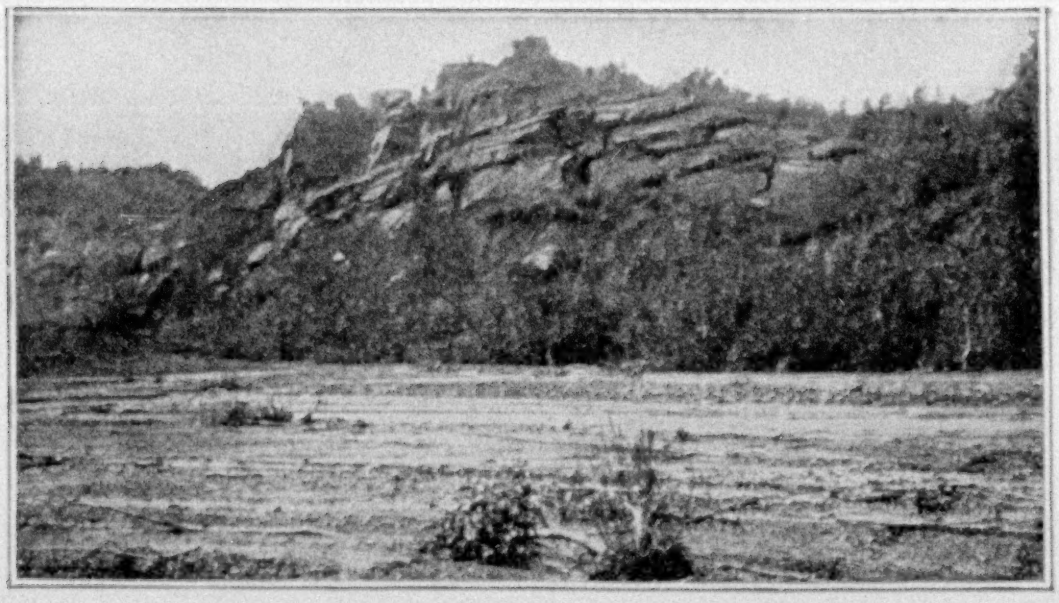
This has had continuous steady retreat, but may yet advance under the earthquake-avalanche impulse (see page 40)







HIDDEN GLACIER IN 1899, 1905, 1906, AND 1909 (TOPOGRAPHY AFTER GANNETT) (SEE PAGES 26, 42–43)

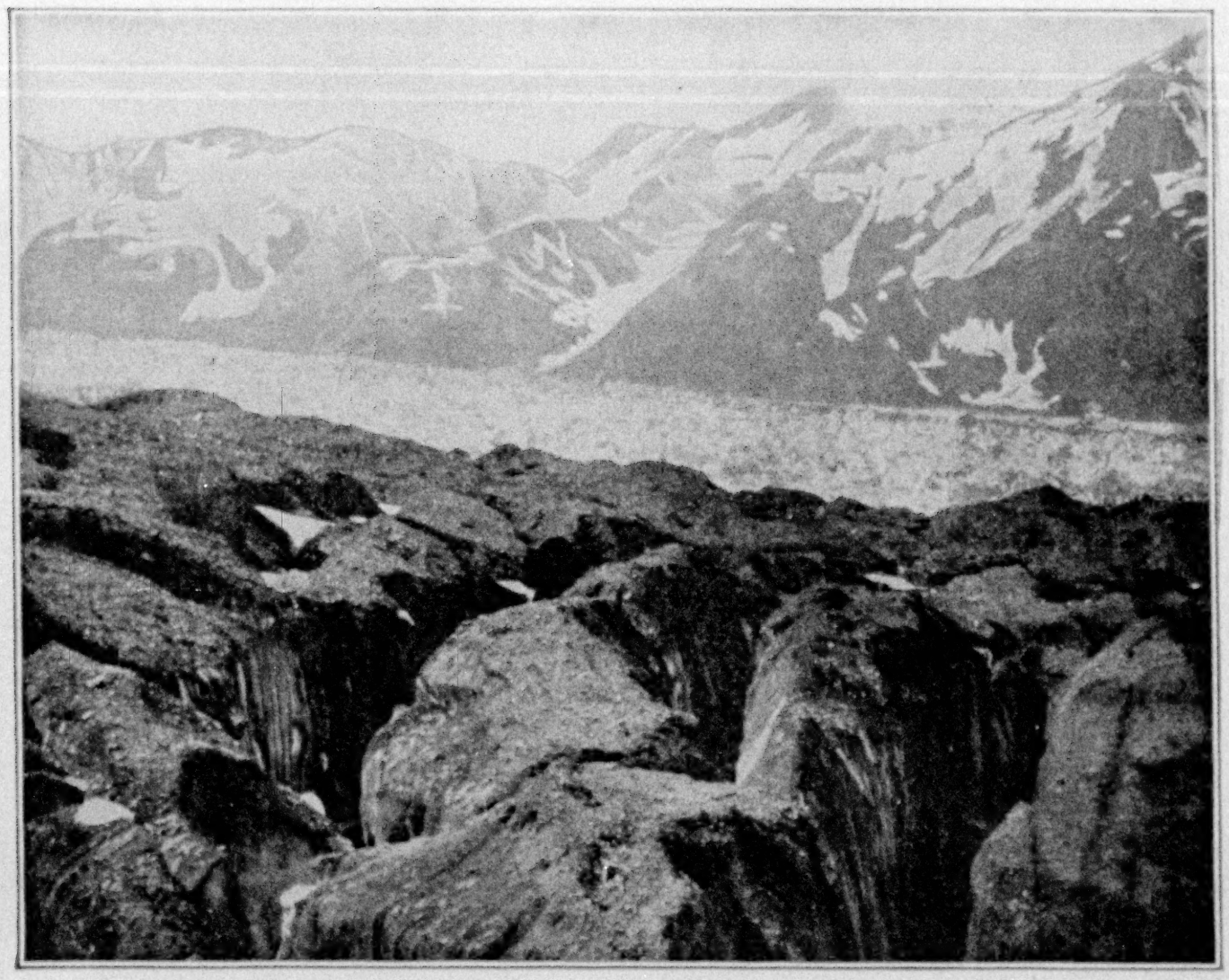


BROKEN EASTERN MARGIN OF THE MARVINE LOBE OF MALASPINA GLACIER, FROM ALLUVIAL FAN OF KWIK RIVER (SEE PAGES 17 AND 28–29)

The broken ice cliff has protruded through the morainic soil and the forest. Blocks of ice fell from this cliff as the party passed, trees crashed down, and the morainic soil was constantly sliding down. Photograph taken August 11, 1906.

BLOCKS OF ICE PROTRUDING THROUGH MORAINIC SOIL AND FOREST COVER, EASTERN MARGIN OF MALASPINA GLACIER (SEE PAGES 17 AND 28–29)

Cottonwood trees, in full leaf, overthrown by the recent thrust that broke the glacier margin. Photograph taken August 11, 1906



THE SURFACE OF MARVINE GLACIER IN 1906, SHOWING THE DEEP CREVASSES WHICH MADE ITS CROSSING IMPOSSIBLE

The National Geographic Society's Expedition three years later, 1909, found these crevasses healed and the surface comparatively smooth and easy of traverse (see pp. 17 and 28-29)

Alaska; but enough has already been seen to make it possible to compare two widely separated regions, and to show that their glacial history has been different. While in both cases ice formerly extended beyond the present limits, the Prince William Sound and Copper River regions have not shared in an important episode of recent great ice advance, of which the evidence is so clear and convincing in Yakutat Bay and Glacier Bay. Why one part of the Alaskan coast should have been favorable to an advance of glaciers to a distance of many miles, and then to recession of these glaciers, while another part gives evidence of no such oscillation, is an interesting question. Other notable differences in glacier condition are also found, such, for example, as the difference between Columbia glacier, which is now farther out than it has been for at least a century and is still advancing, and the Valdez, Nunatak, Muir, and other glaciers, which are now greatly shrunken as compared with their condition a few years ago. Some of these problems cannot be adequately discussed until a wider area has been studied and a greater body of fact accumulated.

In conclusion, the authors wish to express their opinion that the problems of Alaskan glaciers and glaciation present a field for geographical research of the very highest scientific importance. In so large a field not all the glaciers, and in

GALIANO GLACIER (SEE PAGES 14 AND 59–62)

This picture represents in miniature all the conditions of the Malaspina glacier. The white snow fields in the background are constantly feeding the glacier, while in the foreground the ice has been so thickly covered with earth and rocks from the mountain sides that sturdy shrubs have grown up and make it difficult to believe that only a few feet beneath is the solid glacier ice.

MORAINE-COVERED FORESTED EASTERN MARGIN OF THE MARVINE LOBE OF MALASPINA GLACIER

The ice, recently thrust forward, has protruded through the soil; the trees are tilted at various angles and overturned; and the underlying ice, exposed to air and rain, is rapidly melting. Streams of water and of liquid mud descend the slope.

fact not all the larger glaciers, can be given careful study for years to come; for not only are there hundreds of such glaciers, many of which are still unnamed, but large numbers of them are so inaccessible that they can be studied only by special expeditions, expensive from the standpoint both as to time and of money.

While ultimately it is to be hoped and expected that all of these glaciers will be studied and mapped, the present needs can be met by a study of a few selected areas in which it is to be expected that the principal phenomena of Alaskan glaciation will be exhibited, and from which facts can be observed which will solve some of the larger problems and furnish basis for future study which will solve others.

In selecting these areas first consideration should be given to the scientific promise; second, to the variety of phenomena, and third, to the expenditure of time and money. From the latter standpoint accessibility is the key. Alaska is being rapidly opened up by road and railway building and river navigation, and what is today quite inaccessible, may in a few years be easy of access; therefore it seems hardly wise, in view of the broad field of opportunity, to expend large amounts of time and money in a study of what a few years hence may be reached with ease in far less time and at a far less expense.

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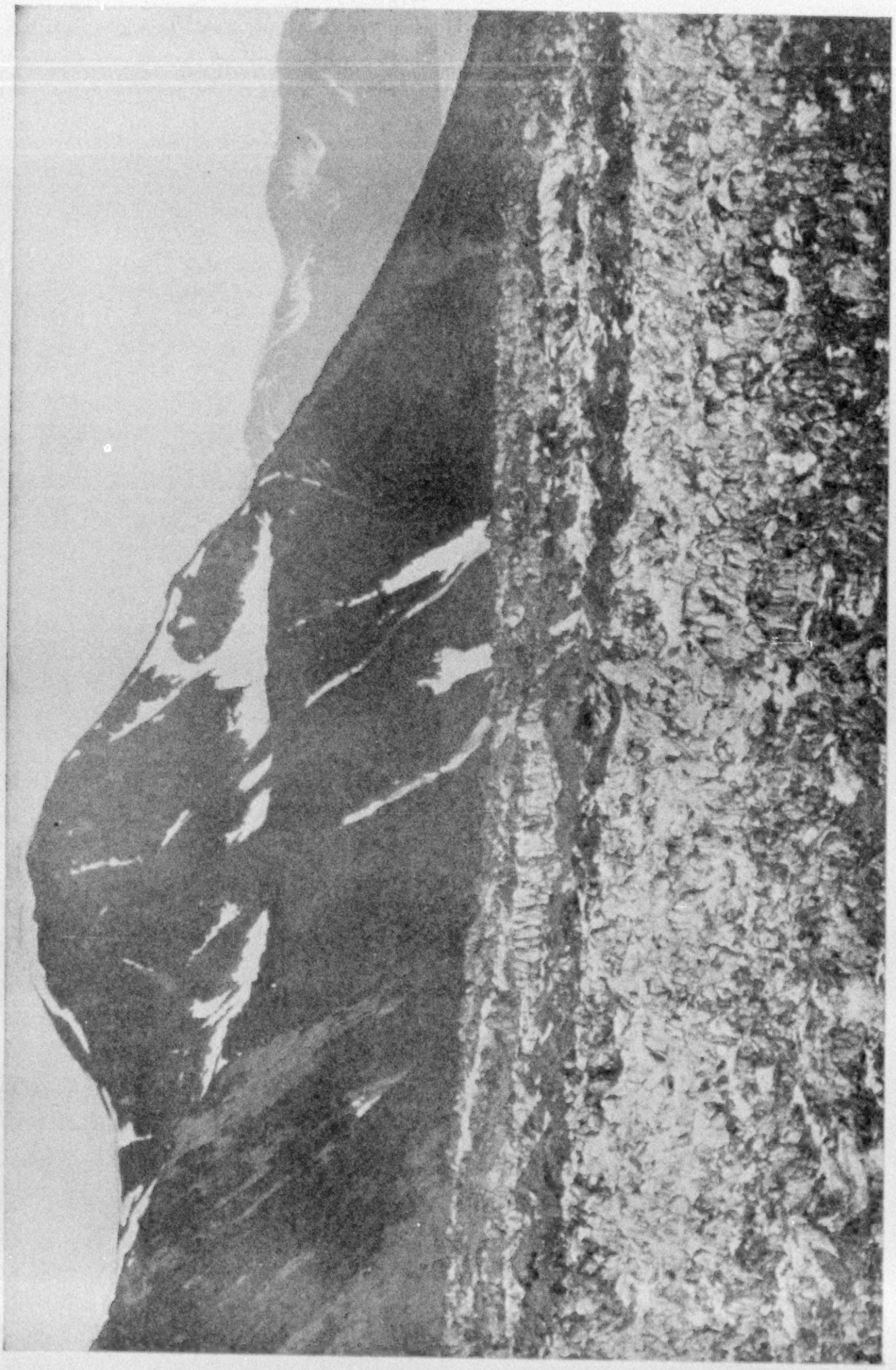
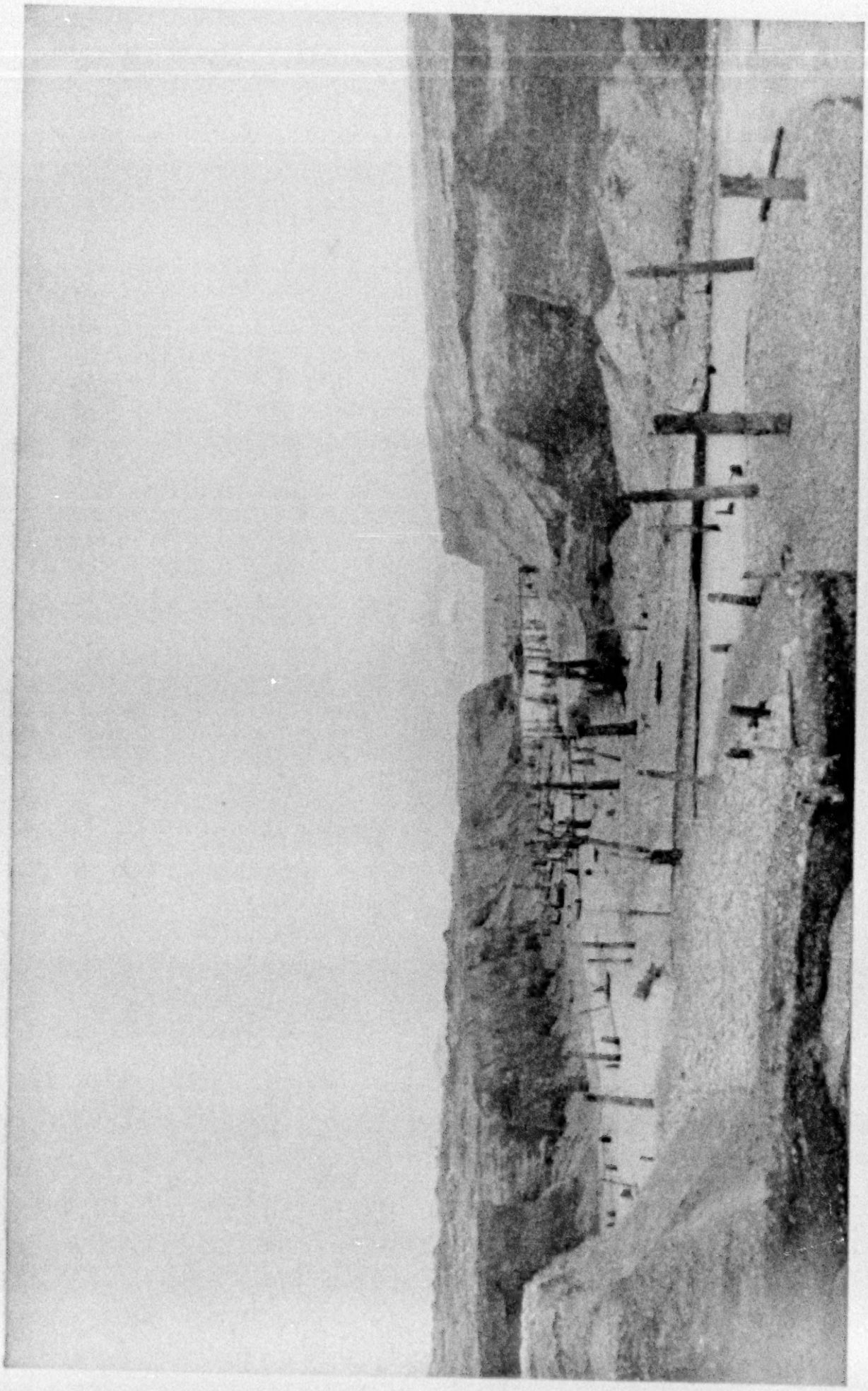


ADVANCING ALTREVIDA GLACIER IN 1906 (SEE PAGES 17, 28–29, AND 39)

Showing the deep, impassable crevasses which are characteristic of a glacier during its advance

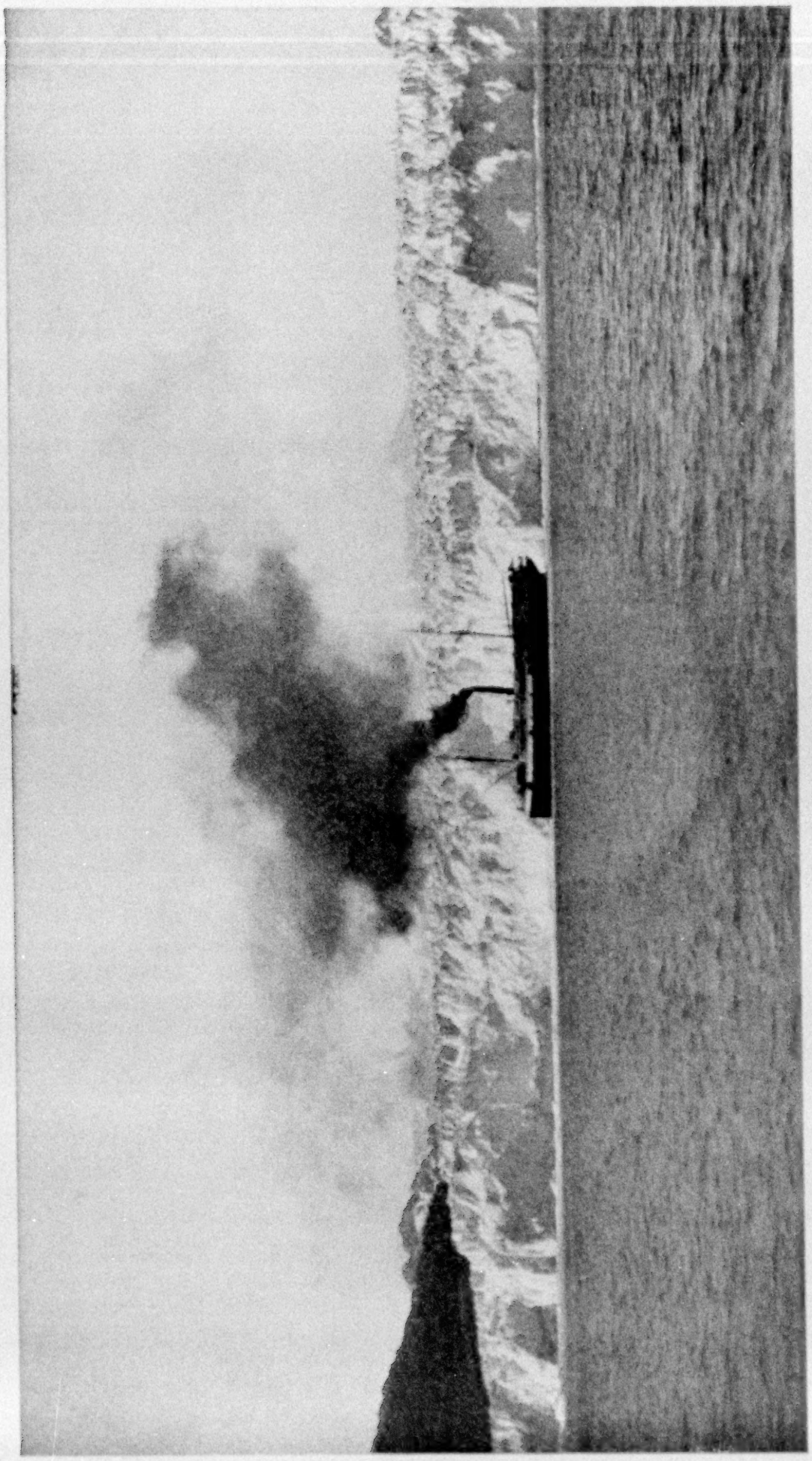
ALTREVIDA GLACIER IN 1909 FROM SAME SITE

Showing crevasses healed and surface covered with ablation moraine, an accumulation of earth and rocks from the mountain slopes (see pages 17, 28–29, and 39)



THE RESURRECTED FOREST: NEAR MUIR GLACIER

Photo from "Harriman Alaskan Expedition." Copyright, 1902, by E. H. Harriman



COLUMBIA GLACIER IN 1899

Photo from "Harriman Alaskan Expedition." Copyright, 1902, by E. H. Harriman (see also pages 30–33)

In view of the promise which this field of research holds forth, and of the considerations just stated, the authors have set themselves the task of outlining what seems to them a desirable program for the study of Alaskan glacial phenomena, so as to bring forth the results which seem to them most important, as follows: (1) Annually for several years a brief visit to Yakutat Bay, perhaps combined with a further study of Malaspina glacier if the advance of its tributaries permit travel over it, a study of the large glaciers of the Alsek valley, the Fairweather coast, etc.; (2) a more detailed study of the glaciers of Prince William Sound and the lower Copper River Valley; (3) the glaciers of the Inside Passage from the Canadian boundary to Cross Sound and the Muir Inlet; (4) the Controller Bay region, and the great piedmont Bering glacier; (5) the glaciers on the north side of the Saint Elias Range and in the Mount Wrangell region; (6) glaciers and glaciation in the great Alaska Range, the Endicott (Rocky) Mountains, the Alaska Peninsula, etc. If such work could be carried on consecutively, as part of a matured plan, the highest results for comparative purposes would be secured; it would be a notable contribution to science if the National Geographic Society should undertake an investigation of this scope.

PHOTOGRAPHY IN GLACIAL ALASKA

By O. D. von Engeln

Photographer of the National Geographic Society's Alaskan Expedition of 1909

ALMOST every subject of geographic interest has one or more phases of which photographic records can be made. It may therefore be inferred that a large number of the readers of the National Geographic Magazine are photographers, and that many of them are engaged in the fascinating task of carrying the camera into the remote places of the earth, as the pages of the Magazine itself testify.

The opportunity to focus a lens on scenes hitherto unpictured is compensation in itself, but an equal interest in such work lies in the difficulties which must inevitably be encountered and overcome when working with the camera away from the conventional dark-room, with its electric ruby-light and other conveniences. To "bring out" a collection of good negatives under such conditions becomes a worth-while task, and one which is in few places more difficult, probably, than in glacial Alaska, especially from that part of this region which is its focal point—the coast along the center of the great Gulf of Alaska.

It has been the privilege of the writer to do the photographic work of two expeditions to this region—that of the National Geographic Society's party of the past summer, and, in 1906, with a United States Geological Survey party. The following paragraphs have been written in the belief that the experiences recorded may be of interest and value to others who are engaged in similar work.

The photographer on a trip to Alaska will find subjects for his camera on the first morning after the sailing from Seattle in the personnel of the passengers. It must be understood that this does not apply so particularly to the excursion steamers, which carry tourists to the interesting points along the Inside Passage, but refers more especially to the boats which carry both passengers and freight to the mining towns and fishing stations scattered along the southeastern and southwestern Alaskan coast, with longer stops at the coast terminals of important routes to the interior mining fields. The second-class passengers on such a steamer are in the main typical

Alaskan "sour-doughs," old-timers, but include a few new-comers or "chechakos." The "sour-doughs" are characters of the greatest interest, representing as they do the last of the American pioneers to westward. The Scandinavian type predominates—men of splendid build, whose eager, alert attitudes as the boat approaches each Alaskan village afford good subjects for the kodaker.

The cabin passengers present more diverse types. Mining, railroad, and construction engineers; successful prospectors; capitalists, judges, and commissioners; scientific men in the fields of geology and forestry; store-keepers, cannery managers, and perhaps a writer or two, make up their number. These are more shy of the camera man, but from their conversation one may acquire an all but complete history of Alaska and the current events of its present-day rapid development.

In passing through the narrow reaches of the Inside Passage, such as Grenville Channel, the photographer is offered many opportunities, from the deck of the vessel, for pictures of the steep, glaciated cliffs of these passages among the islands. Waterfalls, sometimes extending all the way from a high mountain summit to the sea, but more often emerging from the lips of hanging valleys high up on the slopes, descend between the sheltering green of the luxuriant vegetation which everywhere covers the mountain sides, the water in each case appearing as slender threads of foaming, white, high-light.

The first opportunity, however, for securing a truly imposing picture is afforded by the lofty peaks of the Fair-weather Range, all snow-covered, with valleys buried in glacial ice, and towering from 10,000 to 15,000 feet straight up from the sea-level. These mountains are to the northward of the Inside Passage, and the ship is from 10 to 15 miles out to sea while they are in view. A good picture is, therefore, contingent on a clear day and a suitable lens; that is, a lens with sufficient length of focus to enable one to get a large image of the distant peaks on the ground glass.

For such work a telephoto lens is usually recommended, but I have found these very unsatisfactory, because the very small aperture at which they work makes focusing very difficult. In this case it would render their use impossible, as the motion of the steamer would preclude an exposure of the necessary duration. A rapid rectilinear lens, furnished by Bausch and Lomb, of 17½-inch equivalent focus, working at f/16 and fitted with a shutter having a maximum speed of 1/100 second, was found admirable for all kinds of distance work.

The other great peak and mountain range visible from the steamer, as one sails to the north and westward, is Mount Saint Elias and its setting, the latter sometimes inaccurately termed the Saint Elias Giant Alps. Although Mount Saint Elias rises directly from the low ice-plateau of the Malaspina glacier, it is so far distant from the sea that imposing pictures of its pyramidal mass are difficult, if not impossible, to get. One opportunity for a striking snap-shot was missed (because the cameras were stowed away) on the first evening after our landing at Yakutat. That was at the last of June, and the sun set directly behind the peak, outlining it in fire and at the same time casting a triangular shadow of the mountain on the sky, high above the summit. The sky-space between the mountain and its shadow was filled with the varied colors, lights and shadows of the sunset glow, while in the foreground the lower mountain ranges gleamed white in their all-enfolding mantles of snow.

Such opportunities for photographing the peaks of southeastern Alaska are rare, because of the almost continual presence of clouds, and the steady downpour of rain for much of the time on the lowlands. Again, it is the rain and the consequent humidity which make photographic processes so difficult. On the other hand, the same humid conditions provide the snow-fall on the higher ranges, which, in turn, gives rise to the glaciers, on whose presence is dependent much of the pictorial interest of the region.

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WASHING FILMS IN SEA WATER AMONG THE ICEBERGS: "EVERY NEGATIVE ON THE STRIP PERFECT"

The experience gained in the summer of 1906 made it possible to plan to meet the conditions more adequately in 1909, but the hurried outfitting which circumstances necessitated left no time for trying out any of the outfit, and, in fact, gave no opportunity for the inspection of much of it until we arrived in the field. In consequence it was found, for example, that the front board of the plate camera was not accurately centered, and many pictures were taken which were slightly out of focus on one side before this defect was noticed and rectified as well as possible with the tools available in the field. It is possible that this defect was caused, or aggravated, by the moisture of the air causing the wood of the camera-box to swell and draw. In any case, a difficulty such as this illustrates the value of a careful try-out of apparatus before taking it into the field. It may be worth while to remark, in this connection, that in testing a kodak or other hand camera it is well to see that the focus for the 100-foot point of the scale, or infinity mark, has been accurately marked and gives sharp and clear negatives.

The difficulties attendant on loading plate-holders under blankets (especially as it is light all through the night at this latitude in early summer) experienced on the previous expedition led to the purchase of the only *dark-room tent* which could be found listed in the available catalogs. This tent, when examined in the field, proved to be an affair about 8 feet high and square, made up of black duck with a lining of red cotton cloth, the whole sewed up into a cube-shaped sack which fitted over four corner-posts and laid on a framework tying the posts together.

The flat top of this contrivance would not shed rain, and, as we had no extra fly, it was necessary to push up the top with a center pole. Its ungainly appearance earned it the name of the "dog kennel" when first set up. Moreover, the light which filtered through fogged plates only momentarily exposed to it, and, as the black duck faded almost immediately to a dingy brown, it soon became altogether unsafe, and the old blanket expedient had again to be resorted to. However, it served as an outer protection, making it possible to load plates "by feel" inside a lidless grocery box set up on end and lined and heavily curtained with black cloth.

It seems to the author that it would be a both profitable and appreciated enterprise for some photographic supply-house to undertake the manufacture of a trustworthy dark-room tent for use in the field. Such a tent need not be large, but it should have high walls, and, if this necessitates a flat top, be provided with a fly. The outer covering should be of some water-proof material, such as is used for buggy curtains, and it should have a lining of fast-dyed red cloth. If the outer covering of such a tent were torn, under camp usage, it could readily be mended and rendered light-tight by the use of adhesive tape. A tent of this kind would make the loading of plates and their transference from the plate-holders to the developing solution both safe and convenient. The many scientific parties which are working in Alaska should alone make the enterprise profitable.

The greatest pleasure of the summer's work was afforded by the convenient method, and the highly successful results attained by the use of the Eastman Kodak Company's film and plate tanks. Again and again the films came out of the tank every negative on the strip perfect. Where this was not the case the fault was very clearly shown to be with the man who made the exposure.

The same thing was true of the plate tank, but in minor ways this has not been perfected to work so conveniently as the film apparatus. There ought, for example, to be a series of perforations along the edges of the bottom of the plate-carrier, so that the end plates would receive a better washing before transference from the pyro developer to the hypo bath. As it is one must rinse very carefully to avoid getting pyro stains on the end plates. This trouble can be

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avoided, however, by rinsing and transferring to the hypo bath in the dark-room, when there will be no opportunity for the action of light while the developer is still on the plate.

Photographers are accustomed to messing in cold water, but most will agree that an average temperature of 44 degrees Fahrenheit for washing waters does not add particularly to the zest of the pursuit. Melted snow, mountain brook, and sea waters alternately served the photographer's purposes. Nor was it always possible to bring the temperature of the solutions to the desirable mean of 60 degrees. Yet the results for time of development as given in the manual were uniformly good. Unless one cares for dense negatives it is well to remember that the time of development must include the time required to remove the lid of the tank and to pour off the developer. A most convenient method of washing is to place the strip of film, or the plates in their carrier, in a bucket or tank, and weight this to the bottom of a pool in a clear, swift-flowing stream.

To combat the excessive moisture of the region (it sometimes rains constantly for a week, day and night, and if there are two clear days in seven one is in luck) we adopted various expedients. Film packs as large as five by seven inches get out of plane under these conditions, so we carried glass plates. These we kept in a specially constructed box, which had a clamping, rubber-sealing device to render it as nearly moisture-proof as possible. As an additional precaution a quantity of calcium chloride was kept in the box with the plates.

The films were kept in sealed tin cans. After attempting, unsuccessfully, but without spoiling it, to dry a strip of film in the tent, a soaking in grain alcohol was resorted to, and drying in a short time resulted. To use the alcohol effectively it is necessary to immerse the plates or films for at least ten minutes, and, if the gelatine shows a tendency to frill, to admix about 1 per cent of formaldehyde.

A surprising thing, when first encountered, was the short exposure required when photographing in glacial regions. One-hundredth of a second, with a stop of f/6.3 sufficed on overcast days, and on a day only slightly hazy the same exposure with a stop of f/11 was ample. This is accounted for by the enormous amount of actinic light which the blue glacier-ice, the water, the white snow of the mountain peaks and the rock slopes, which latter are bare of vegetation near the glaciers, reflect on all sides. It is to be remembered that diffused light is the most actinic—that the blue of the sky is in fact due to this diffused light. Making a panorama from the white ice-top of the Hidden glacier, the lens had to be pointed directly toward the sun, and the picture included snow-covered mountains and the sunlit sea—surely a chance or two for halation and fog.

The necessity of securing all the record pictures required by the scientists, and the limited number of clear days available for camera work in this region, are conditions which combine to restrict very narrowly such aspirations as the photographer may have for doing pictorial work. The record pictures must be taken with more regard to encompassing all possible detail than to the effectiveness of the composition. Again, the scientific notes and observations at any one site generally require much less time to secure than is necessary for the exposure of the requisite number of plates. The party is, therefore, ready to move on as soon as the photographer has once more shouldered his camera and tripod.

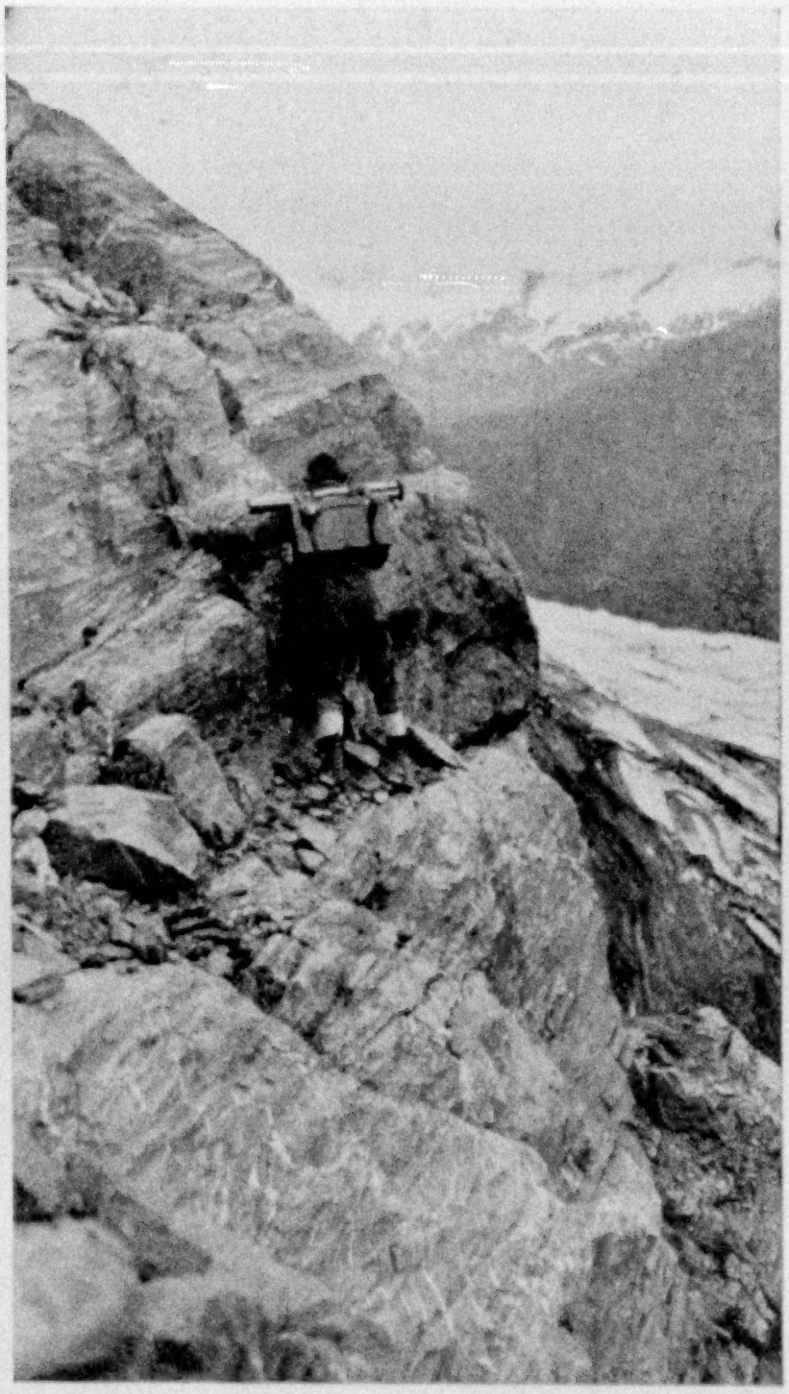
To focus on the gleaming front of some tidal glacier, whose ice-wall is perhaps 300 feet high, and wait deliberately for the chance to snap the birth of an iceberg as it is detached from the parent cliff and falls with a thunderous crash into the sea—that is a craving that has possessed me on both trips, but was never satisfied. We many times witnessed the spectacle, but there was no opportunity to photograph it from a near-by site.

Mentioning the thunderous crashes which announce the birth of new ice-

bergs recalls an idea I had one evening when we were encamped on the west shore of Yakutat Bay. This was to the effect that a city photographer ought to feel perfectly at home in glacial Alaska. The Arctic wilds have been termed the "silent places," but no phrase could have been farther from the truth as applied to this time and place. The rain was beating upon the side and top of the tent, and the wind kept snapping its loose flap endlessly.

In front of the tent the surf roared in ascending and diminishing crescendos, sending surge after surge over the iceberg-littered sand beach. Farther out in the bay the occasional breaking up and overturning of a big iceberg gave rise to a continuous sound like the rattle of a near-by express train. At rarer intervals one heard the distant boom, like that of a big gun, sent forth by the detaching of an iceberg from the glacier front.

Nor was this all. To one side of the tent a mountain torrent came rushing across the flat, while from the mountains in the rear one heard the low rumble of avalanches among the cascading glaciers occupying their steep valleys. The combination, and simultaneous occurrence, and continuance of all these noises gave rise to a very pandemonium of sound, and of a volume which would easily overtop the roar of the busiest of busy city streets at the height of the day's activities.



THE PHOTOGRAPHER'S PACK

While the pictorial interest of the scientific-record pictures often suffers because the point of view must be chosen with more regard to showing the detail of some particular phenomenon than to the composition or the character of the foreground, still there are opportunities for securing many striking effects in a country of such scenic magnificence, even though the pictures are to have their chief value as records. Sometimes, too, a whole geological story may be included in one picture, as is the case of the photograph of the Galiano glacier reproduced on page 48 of this Magazine.

This illustration is unique in that it reproduces a view where are shown in miniature all the conditions and phenomena of the extensive and famous Malaspina glacier and its feeder tributaries. On the mountain summits of the back-

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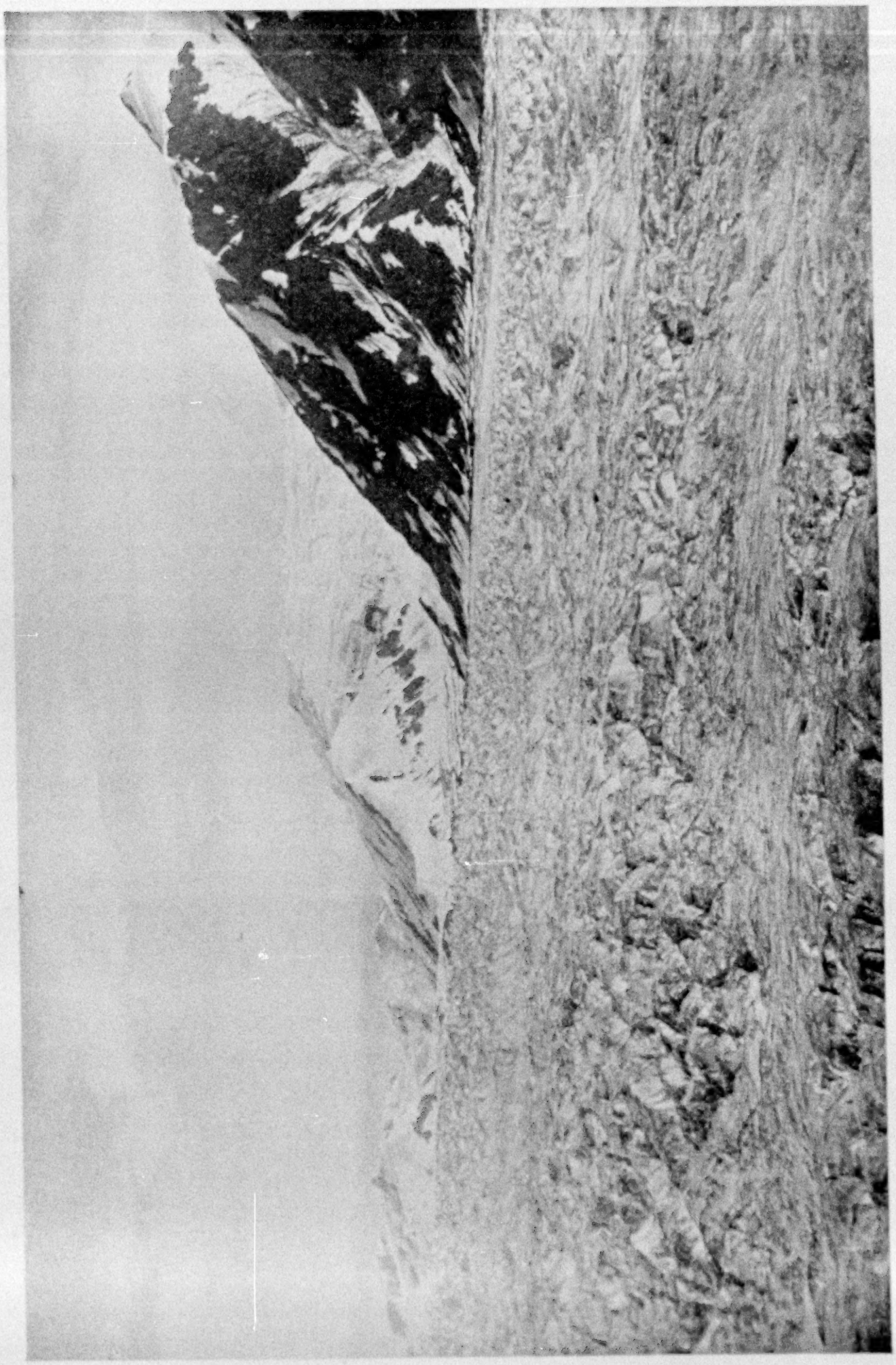
LOOKING SEAWARD FROM THE HIDDEN GLACIER

Camera pointed directly toward sun. Snow, ice, clouds, sea, and mountain summits in one view, detail in all and no halation (see page 58; also page 42)



HIDDEN GLACIER, LOOKING SOUTHEAST: A STUDY IN GRAYS (SEE PAGE 58; ALSO PAGE 42)

ground are the snowfields, giving rise to a series of cascading glaciers, typically crevassed, which flow down the steep slopes of the cirque-like valley. The contributions of these cascading glaciers form the main stream of the valley glacier below, showing white, crevassed ice at its upper end. As this glacier emerges from between the mountain walls, however, it expands, its crevassing disappears, and in the middle distance of the picture the ice surface is already thickly mantled with ablation moraine (an accumulation of earth and rocks). In the immediate foreground the ablation material has buried the ice so deeply that one would hardly suspect that there was ice underneath. Vegetation has gained a foothold, and the only sign to betray the inert glacier below is the occasional slumping induced by its very slow melting.

In Yakutat Bay and its extensions there is, except on the low ocean foreland, an entire absence of forest growth—a condition accounted for by the recency of the glaciation. When working here the outdoor photographer comes to realize how much he is dependent on trees to lend grace and softness to his compositions. The succession of pictures that he secures in this wonderful region are monotonous, harsh, and forbidding, because they so much lack the soft shadows and the graceful contours furnished by the forest citizens of other climes.

In Prince William Sound, however, especially in the region about the Columbia glacier, a forest of spruce and cedar advances close to the ice margin. A thick turf of peat covers the floor of these woods, and this peat in turn is dotted with little lakelets which have their edges hemmed with bright flowers. When climbing the slopes of the mountains of this neighborhood one is afforded most interesting vistas of water, woods, ice, and snow through the forest glades and lanes.

I have been informed that Curtis, the famous photographer of Indians, intends eventually to picture the Alaskan natives. He will find some very interesting material in the neighborhood where we worked. At Yakutat, however, the Thlinkets have been in contact with the white man so long that typical studies are difficult to secure. At Dry Bay, a village to the south, a tribe of the same nation still live in their primitive environment, and probably do not demand a fee of "two bits" (25 cents) when asked to pose, as is customary at Yakutat. If the fee is not forthcoming the women will cover their faces and run. The children, however, are more docile and afford some interesting studies.

To the untutored mind this desire on part of the white man to secure many pictures of everything with which he comes in contact must present a perplexing problem. This was indicated by the attitude of our Japanese cook. On each favorable day we would leave camp early in the morning, taking with us our cameras and instruments. But on our return late in the evening we brought back no gold or trophies of the hunt. The cook's curiosity was aroused to such a pitch that he begged permission to accompany us on one of our trips. This proved to be a hard morning's work, climbing over mountain spurs and struggling through alder thickets. At noon we came to a glacier front, set down some notes, exposed a number of plates, ate a light luncheon, and prepared to return. That was too much for the cook; he burst out: "Walk so long—so hard trip—only picture take! Mak' me sick!"

In conclusion I would emphasize this caution: Do not attempt to carry exposed but undeveloped plates or films back to civilization from a region whose humidity is equal to that of the southeast coast of Alaska. Only a few will develop up as perfect negatives. Most will be mealy, or, worse, be peppered with opaque spots the size of a pinhead, whose origin is difficult to explain. Develop in the field, and as soon as possible after exposure.

THE DISCOVERY OF THE NORTH POLE

THE principal feature of the Annual Banquet of the National Geographic Society, December 15th, was the presentation of a special gold medal to Commander Robert E. Peary, United States Navy, for the discovery of the pole, and of Hubbard medals to Captain Robert Bartlett for attaining the farthest north, and to Grove Karl Gilbert for achievements in physiographic research. Telegrams of congratulation were read during the evening from former President Theodore Roosevelt, who, on behalf of the Society, presented the Hubbard medal of the National Geographic Society to Commander Robert E. Peary in 1906; from the Duke of the Abruzzi, and from the Geographical Society of London and the Geographical Society of Berlin.

About five hundred members and guests attended the banquet, including representatives from many foreign countries and from all parts of the United States. Toasts were responded to by the Dean of the Diplomatic Corps, the Italian Ambassador, Baron Mayor des Planches; the French Ambassador, Hon. J. J. Jusserand; the British Ambassador, Hon. James Bryce; Speaker Cannon, Andrew Carnegie, Admiral Colby M. Chester, Professor J. Howard Gore, General Thomas Hubbard, President of the Peary Arctic Club, and Hon. John Barrett.

The medals have been inscribed as follows:

> A Special Medal Awarded by the National Geographic Society to Robert E. Peary for the Discovery of the North Pole, April 6, 1909.
>
> The Hubbard Medal Awarded by the National Geographic Society to Robert A. Bartlett, Commander of the S. S. *Roosevelt*, for attaining the Farthest North, 87° 48', March 31, 1909.
>
> The Hubbard Medal Awarded by the National Geographic Society to Grove Karl Gilbert for original investigations and achievements in Physiographic Research during a period of thirty years.

The telegrams received were as follows:

NAIROBI, *December* 12, 1909.

National Geographic Society, Washington:

Extremely pleased. Desire through you to extend heartiest congratulations Peary on his great feat which you have thus recognized.

ROOSEVELT.

LONDON, *December* 15, 1909.

National Geographic Society, Washington:

Hearty congratulations to Peary on medal. Highly gratified at medal to Bartlett.

DARWIN,
President, Royal Geographical Society.

BERLIN, *December* 15.

COMMANDER PEARY,
National Geographic Society, Washington:

The Geographical Society of Berlin sends to its honorary member heartiest congratulations on these honors well deserved because of your conquest of the pole which is rich in results, and hopes early in the spring to be able to similarly honor you here.

WAHNSCHAFFE, *President.*

THE TOASTMASTER, WILLIS L. MOORE, PRESIDENT NATIONAL GEOGRAPHIC SOCIETY

On behalf of the Board of Managers of the National Geographic Society and of the fifty thousand and over members of the organization, and especially of the three hundred and fifty members of the Society gathered at these tables tonight, I extend to you, our guests, a hearty greeting. We are met to celebrate a great achievement. This is an Arctic night at the pole. But we trust that the fervor of our greeting for you will be tropical in its significance.

And with that word of greeting to you we will begin the exercises of the evening, and we shall endeavor to dismiss the gathering within a reasonable time. That is a little intimation that we do not expect very long speeches from any particular individual. I will make exceptions to that on the part of the three Ambassadors on my right and left. They cannot talk too long for the National Geographic Society. One comes to us from that nation that has given so much

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to the world in literature and art, the mellowing influence of its beauty and antiquity shedding a soft refulgence throughout the entire world. A member of the royal family of that nation was entertained in this very room three or four years ago, who has achieved great honor in Arctic exploration, and we have a word from him tonight. I shall introduce the Ambassador from Italy, Baron Mayor des Planches, to say a few words and give us that message. The Ambassador from Italy.

THE ITALIAN AMBASSADOR—BARON MAYOR DES PLANCHES

Mr President, ladies and gentlemen: I remember having been present at another banquet given by the National Geographic Society, in which Commander Peary was, as he is now, the guest of honor.

Commander Peary had already at that time reached the highest polar latitude, beating the record of a young Italian explorer, the Duke of the Abruzzi. I had not, then, special instructions to congratulate the Commander for the splendid result he had already obtained, but I was sure that His Royal Highness, chivalrous as he always is, was applauding the achievement of his fortunate rival. I expressed to the winner the felicitations of the defeated, and the Duke afterwards cordially approved of what I had done.

Now things are different. As soon as I received the kind invitation of your President to be here tonight, I cabled to the Duke that I would have the pleasure of meeting the glorious conqueror of the pole. A few hours after I received the cablegram which I ask your permission to translate:

"Many thanks to you for giving me the opportunity to express to Commander Peary my heartfelt felicitations. Tell him in my behalf that I am happy that the pole has been discovered by the explorer whose courage and perseverance deserved such a reward.

LOUIS OF SAVOIA."

THE FRENCH AMBASSADOR—HON. J. J. JUSSERAND

Mr President, ladies and gentlemen: Two years ago we were gathered together, almost day for day, in this same room, under the same chairman who has just spoken in such touching words of my country, and such undeserved ones of her representative; and we were gathered together also to commemorate a pole discovery. It was the discovery of the magnetic pole. I was asked to say a few words. Offering to you excuses for quoting myself, I beg permission to recall that, considering the time to come, I expressed myself thus: "Some new expedition, led through air or through water, by some maybe among the men present here today, will certainly, in the near future, gain the first sight of the long-sought North Pole." And looking at the list of those present on that day, I find that there appeared the name of "Commander and Mrs Robert E. Peary." I think I may say that, once in my life, I spoke as a prophet.

Momentous changes have come to pass in the world and in this land. For a very long time, during the period to which our chairman alluded just now, America was not the land that produced explorers, but the land for explorers to seek. The day in August, 1492, when a certain Spanish ship left Palos and floated across the unknown sea, resulted in the revelation to wondering nations of a new, unsuspected, and immense world; and the energies of all those who wanted to discover, to learn, to win, to explore, to get fame and wealth for themselves and their country, were bent for centuries toward this continent more than toward any other part of the globe. The ocean was crossed and recrossed by the tiny crafts of some of the best sons of France, England, Italy, Holland, Spain, Portugal, Scandinavia. We French certainly did our part, as we explored further inland than any, and made known to the world the resources and beauty of the valley watered by the "Mechacébé."

For a very long time, indeed, it was the desire of the pluckiest to come to these shores and explore those new regions so extraordinary, so beautiful, yet so thoroughly unknown that it took till our own lifetime to get a somewhat accurate idea of their contents. Many of us were already in our manhood when the Yellowstone Park was revealed to the admiration of the world.

But before that moment a great change had taken place; the field for exploration had begun to produce explorers, and it has never ceased since; explorers of unknown lands, like Rockhill, Crosby, and many others; explorers of the depth of the seas, like Agassiz; of the realms of electricity, like Graham Bell and Edison; of the sun, like Doctor Hale; of ancient Babylonic civilizations, like those scientific missionaries sent abroad by the Chicago University, and explorers, above all, of that unknown world into which French Montgolfier was the first to rise, the world of air, mastered by the plucky men of our day, in the front rank of whom stand your famous compatriots, the brothers Wright.

And while so many explorations went on, one remained ceaselessly striven for, ceaselessly unachieved: the one that had for its object the conquest of the pole. The longing for that discovery is of a comparatively recent date, but once its hold on mankind began, it proved one of the most ardent men had yet experienced.

The ancients had not evinced any great anxiety about the polar regions. They knew the north was a strange frozen place with weird legends about it, a region, said Tacitus, where looking toward the east one can see Phœbus rise: "The sound he makes on emerging from the waters can be heard, and the form of his steeds is visible."

In the last century, the problem became for mankind one of intense interest, one which *had* to be solved, were it, as indeed it was, at the cost of many an heroic life. And the great labor began, never to be interrupted until could be possible such a gathering as today's, in which the National Geographic Society of America is to bestow its medal on the now most famous of its members. Long was the search and hard was the toil, from the days of Sir John Franklin and Kane to those of Nansen, Nordenskiold, royal Abruzzi, and your admirable Greely remaining three years unrevictualed in the frozen north.

I well remember how, in days long past, I followed as a child, with my brother and sisters, our hearts beating with emotion, the efforts of one of the imaginary heroes of that prophet-novelist, Jules Verne; a prophet-novelist indeed, for most of what he fancied has become reality; his fancy submarines have become our real ones, the world he announced where everything would be done by electricity is now near at hand; his dream dirigibles have become our tangible ones, and the conquest of the pole, which he foresaw, is now a fact. He described it in advance, and not so badly, for he told us that, at the pole, there was no land, but only sea, and Commander Peary has just returned to tell us that it is so. Truth to say, the writer asserted that the sea was an open one, and I have present in my mind, as if it were a thing of yesterday, a view of that open sea pictured in his book, and along its shore quantity of birds, the like of which, I am afraid, Commander Peary had not the satisfaction of killing and eating. But as you know, there is no prophet so good that does not make now and then some little mistake.

Well, after that long search, and so many proofs of endurance and valor given by many, the deed is done and the coveted prize belongs to you, Americans. If we, French, did not do much for the solution of the problem, busy as we were, and usefully busy, exploring elsewhere in Asia, Africa, South America, we know full well what peerless merit there was in doing what your compatriot has accomplished, and about which what there is to say is going to be expressed by our learned chairman tonight. Commander Peary will allow me to offer him a tribute of admiration, and the congratulations of my country for the fame he

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has won and the deed he has accomplished.

THE TOASTMASTER

We have at our tables many representatives from our National Congress from both houses of that great body. We mean no disparagement to the legislative institutions of any other country when I say that the American people have a proper reverence and respect for their own representatives. I do not believe that there is a cleaner, an abler body of national representatives met anywhere in the world than the National Legislature of the United States. We are honored tonight by having at our board the Speaker of the House of Representatives. People do not apply an endearing term to a public man that they do not down deep in their hearts respect, and I shall, as an honor to the National Geographic Society, ask the Speaker of the National House of Representatives to say a word at this board.

SPEAKER CANNON

Mr President, ladies and gentlemen of the National Geographic Society, and guests: It is supposed that the present incumbent of the Speaker's chair is a czar. Such being the case, the rules of the House in committee of the whole on the state of the Union will be enforced; that is, the five-minute rule. Note the time and let your gavel fall at the end of five minutes, unless I leave the floor earlier than that.

I am glad to be here. I am glad that the National Geographic Society have settled one thing. Peary or Cook found the North Pole, and you stated which, and I have implicit confidence in your judgment. How marvelously the nineteenth century has witnessed the opening of events which three hundred years prior thereto the nations of Europe sent in their colonies to the new continent to struggle for mastery. Their bones are dust and their souls are with the saints, but the coming of the French and the German and the Scandinavian and the inhabitants of Great Britain, and the present coming of the Italians and the Hungarians, and the Spanish who came first and wrought great things in the new continent, have settled all questions. We are glad to congratulate ourselves in the United States that we have the most enterprising and of the best of those countries that have made our own country their country, and have been assimilated and form our civilization. You cannot sing the *Banzai* national air, you cannot sing "The Campbells Are Coming," you cannot sing "The Watch on the Rhine"—which always seemed to me in comparison with all the other music like the grinding of a great glacier—you cannot sing them anywhere in the boundaries of the Republic but what the huzzas will come. How marvelously the progress!

I am but yet a young man, and yet I recollect very well when it was gravely proposed in the Senate of the United States that a statue should be erected to the god Terminus on the peaks of the Rocky Mountains, and that should be our western boundary. All questions of territory have been settled, and the United States is the common territory of what we can gladly say is the best blood of the European countries. I say best blood because the enterprising young men come to new countries that promise in their judgment a reward for their enterprise and courage. I am glad that the North Pole has been found. I am glad for many reasons. In the first place it will stop adventurers after notoriety or adventurers in fact from endeavoring to discover the pole. We know now whether there is land there, and I am glad to know there is no land there and I can prove it by Peary, because there is no chance for any discussion about the conservation of natural resources. There can be no ice factory, because it is brackish and the ice would be worthless.

I am glad to be with this Society. I have had many invitations. It has so happened that this is the first one that I have been able to accept. But, after looking into your faces and congratulating you over the history of this Society—over the founder of the Society, who has

crossed over, but his work is still with us—and after congratulating Commander Peary, I pay my respects to the representatives of the many great governments here tonight and will just in one sentence sit down. When next, Mr President, John Gilpin rides, may I be there to see.

THE TOASTMASTER

Many of our guests are familiar with the aims and objects of the National Geographic Society; all are not, and so I shall introduce for a few minutes our Professor J. Howard Gore, Professor Emeritus of George Washington University, a member of the Board of Managers, to tell you something of the aims and objects of this institution.

THE NATIONAL GEOGRAPHIC SOCIETY—BY JAMES HOWARD GORE

In some future edition of the Book of Proverbs it may be written: "Whoso tooteth not his own horn, yea verily the horn of the same may not be tooted." The President of this Society must have anticipated the wisdom of this injunction when he asked me to be the horn soloist for the Society.

To our colleague, Mr Henry Gannett, is given the credit of having originated the flattering invitation, "Sit down five minutes and tell me all you know." If this idea was in the mind of our President when he asked me to tell all I knew of the activities of the National Geographic Society in ten minutes I hope he intends that I shall keep the change, for it will not need so much time to traverse in outline this topic, though its bounds be the points in which the ultimate east meets the ultimate west and the north has the south for its antipode.

That we exist is attested by a membership of more than 50,000, and the question as to why we exist must be answered favorably by the thousands who each year come into our ranks.

I was greatly impressed a few years ago by a set of drawings showing the way in which geography is taught in the public schools of Brussels. The first of the series showed the plan of the classroom, with the position of the pupil's desk. The second gave the floor-plan of the building with special indication to mark the room which was the entirety of the first lesson. As lesson followed lesson the pupil had located the building with respect to the prominent buildings of the city, the situation of the city with respect to the other cities of the kingdom, the outlines of the kingdom, the place of the same in the continent of Europe, Europe's place on the eastern hemisphere, and finally a map of the entire world.

In this way the pupil oriented himself with respect to his playmates and their immediate surroundings with respect to the great world of which they were parts. But in the lessening scale the pupil, though great in his own conceit, dwindled as lesson followed lesson and the world of which he formed a part grew vastly in importance.

The proper study of mankind is man—not man in his littleness, in his finiteness, but the house in which he lives, the town in which he dwells, the land he calls home, and the world over which he roams. Each day's walk takes him to a different point and every day's journey gives to him a new geographic position.

The air he breathes is wafted along by purifying currents whose movements we strive to know. The water that slakes his thirst follows courses whose meanderings we want to trace; the paths he treads, the roads he travels and the oceans on which he journeys must find places upon our charts.

The purpose of our Society is to know these things and to diffuse abroad our knowledge. We seek new facts through exploration and we scatter them over the civilized world on the pages of the best geographic magazine that finds a place on the reader's table.

Our affairs are directed by a board selected from every walk in life fitted to aid in our great endeavor. The ablest business men of our city guide its financial interests. By their side sit those who have explored the frozen regions of the north and others who have labored under

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tropical suns. Astronomers who follow the orbits of celestial worlds, geologists who read the testimony of the rocks and tell us the story of the earth on which we dwell; physicists to measure the stress and strain of those great cosmic forces that shape our globe, and geodesists to compute its resultant form; botanists to trace the migrations of plant life and meteorologists to chart the winds that waft the seed; a physician to direct our studies of the relation of health to locality and a biologist who gives to each form of animal life its metes and bounds; a statistician who places in stately columns the figures that show economic development and achievements and a journalist lays for us a course through the world of letters. The world's greatest inventor gratifies our Athenian thirst for new things, and officers of the Army and of the Navy see to it that our facts are well marshaled and our conclusions prove invincible.

These men—busy men—gladly give their time to the great work of this Society, and, seeking no reward, find full compensation in the conviction that under their guidance the Society is living up to its avowed purpose to increase and diffuse geographic knowledge, and sister societies throughout the world gladden our ears by repeating the vesper anthem of the sixth day of creation when the Maker, in looking upon His work, said, "It is good."

THE TOASTMASTER

It might very fitly be said that the only reason that a man may have for the acquiring of more wealth than he needs for his own material wants is that he may give wisely and give well; that he may aid in the betterment of mankind, in the uplifting of civilization, in doing something to make the burdens of his fellows a little lighter, and to add more to the intellectual appreciation of those who study the great problems of the universe. There is no man in the world who has done more to help in that great work of uplifting mankind than that little giant, Andrew Carnegie. He does not expect to speak to you tonight, but I know that no matter where you place him, no matter from what altitude you drop him, he will always land upon his feet. Therefore I introduce to you now to give us a few words—and they are always words of inspiration when they come from him—Mr Carnegie.

MR ANDREW CARNEGIE

I have often been surprised in my short life, but never quite as much as at this moment. I promised to talk to the Associated Press in New York, now banqueting at the expense of the New York *Times*, and I had just spoken to the party there through the telephone. I met Commander Peary and he had just preceded me. He is not only a fellow Pennsylvanian, but he comes from the crest of the Alleghanies at Cresson, where I spent my summers when a young man. I had the pleasure of presenting to Commander Peary honorary membership of the Pennsylvania Society recently and did it in these words, and I was so glad that Master Shakespeake came to my relief: "Fellow Pennsylvanian, your hand in mine—'Yours is a triumph where honor travels in a path so narrow that but one goes abreast.'"

I listened to what you said about giving surplus wealth. Well, I said to the gentlemen and ladies I addressed last night at the Carnegie Institute here, as I pointed to the professors that were gathered from various stations, from the Pacific, from the Atlantic, and the work they had done—I pointed to the trustees who have one and all given years of their life to this work—"theirs is the credit, theirs the triumph. I only gave money—mere dross in itself—these men have given their lives, themselves, to the great work of obtaining knowledge and spreading it throughout the world, not for one country, but for all the world. No rivalry, all anxious to help each other in the obtainment of knowledge."

That is what makes human life sublime. I, who only give money, give the material body only. It is those workers who have infused into the dead, inert

matter the soul within, and these are the men who are entitled to the credit. And so it is with all the money I give.

When I gave Doctor Billings one morning seventy-eight libraries for New York—that was the biggest wholesale order I have ever filled—I was met with congratulations the next morning when walking down the street. "What do you congratulate me for?" I asked. "Why, for giving New York seventy-eight libraries," was the answer. "Cannot receive your congratulations, gentlemen," was my reply, "but if you will congratulate me upon the bargain I made with New York, by which she agreed to maintain seventy-eight branch libraries free to all the people, shake."

I thank you for inviting me here. I thank you gentlemen for your applause and ladies for your smiles. I am the happiest man in the world, because I know that it is not what I have done that I pride myself upon. It is rather upon what I have induced others to do. Ladies and gentlemen, let me assure you I make splendid bargains with all the money that I apparently give away for nothing.

THE TOASTMASTER

Mr Carnegie gives all the credit to those who are doing the work under his beneficence, but I would say to him that that good old Scotch brain of his never gave a dollar that he did not in his wonderful divination see far at the end some beneficent purpose, and I would say to him that a stream never rises higher, sir, than its source.

We have on our Board of Management, I am proud to say, a very wide diversity of talent, and I shall introduce now Admiral Chester, of the United States Navy, formerly Director of the Naval Observatory, who had charge of the party that went to Africa several years ago to view and to observe the eclipse, and who has done a great deal of highly creditable scientific work. We shall ask him to say a few words with regard to the work of Commander Peary in the polar regions during the past 20 years.

TWENTY YEARS' SERVICE IN THE ARCTIC—REAR ADMIRAL COLBY M. CHESTER, U. S. NAVY

My distinguished colleague has given an account of the objects of the National Geographic Society, and it is my privilege to present a brief statement of the work done by our doubly honored and highly esteemed member, Commander Peary, work that has resulted in such signal success as to probably make him the honorary member of nearly all geographic societies of the world.

Beginning back in 1886, Mr R. E. Peary, then a young civil engineer of the U. S. Navy, originated and put into operation an entirely new project for Arctic exploration, and with a Dane, Maigaard, reached a point near Disco, Greenland, some 50 miles from the sea. With the experience and whetted appetite for Arctic exploration gained on this trip, he soon organized a second voyage to the Polar Seas and landed at McCormick Bay, in August, 1891, and although his leg was broken in crossing Melville Bay, and he had nothing more than an Arctic winter and its attendant discomforts before him, he persisted in his determination to go north, and but few people can realize what he courageously must have passed through during that long Arctic night.

His primary object was to study the Esquimos with a view to utilizing them as a force with which to eventually reach the North Pole, and he took upon himself their habits and customs to better enable him to gain their confidence and command them when ready for the campaign quite on the same principle as our army has organized Porto Rican and Philippine Scouts to deal with military subjects which the natives of the country can best negotiate.

Early the following spring Peary, now able to travel, made a brilliant sledge journey of 1,300 miles, crossing the divide of 5,000 feet elevation between Whale Sound and Kane Sea, in Greenland, reaching the northern edge of the inland ice, near 82° north latitude, and discovering Independence Bay.

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Again in 1894, after struggling and sacrificing his personal comfort and means to raise funds for his third expedition, we find Peary back in the frozen north with a slightly increased force, making a remarkable sledge journey of 134 miles in 13 days to an elevation of 5,500 feet.

Here he was met by violent gales and cold weather, and with his dogs dying and his men disabled, he sent his main party back to the coast, while with almost superhuman effort he plodded on another 85 miles to the good, only to be finally overcome by the elements and forced to return to his base of supplies.

In spite of the fact that he had insufficient food and fuel and that there was but little hope of replenishment, Peary would not return to the United States when the visiting steamer *Falcon* arrived in 1894 to take him back, and he spent the following winter in accumulating the resources of the region at Bowdoin Bay, living with Lee and his ever faithful Hensen as the Eskimos live, and gaining recruits for the next march to the north.

This began in April, 1895. With his two men and 63 dogs he had made but three marches when one of his Eskimos deserted with the outfit he had struggled so hard to accumulate; but Peary, undiscouraged, pushed on.

After a journey full of hardships such as had never been successfully overcome on any previous Arctic voyage, he again reached Independence Bay, whence he returned to Bowdoin Bay, with man and beast on the verge of starvation and everything but Peary's indomitable pluck entirely exhausted.

On board the little steamer *Kite* his party reached Newfoundland, September 21, 1895, and thus ended the third expedition.

General Greely speaks of this trip as follows: "If Peary's advance beyond his buried cache (on the highlands of Greenland) was one of the rashest of Arctic journeys, yet the courage, fertility of resource, and physical endurance displayed by him and his companions placed their efforts among the most notable in Arctic sledging."

Peary by this time had a thorough knowledge of the men with whom he was to finally reach the goal for which so many generations have struggled in vain. He had weeded out the dishonest ones, honored the good ones, and educated them all.

In June, 1898, Peary left New York on board the *Windward* for a four-years' expedition against the pole, this time carrying on explorations on the west shores of Baffin Bay, where he determined the continuity of Ellesmere and Grinnell Lands, and in December he was badly crippled and nearly lost his life, his feet being so badly frozen as to cause the loss of eight toes by amputation, yet he took the field again in a few weeks after the operation. In the spring he discovered Cannon Bay, and probably Heiberg Land. The winter of 1899-1900 was spent at Etah, from which place he made his first effort to reach the pole. After following the west coast of Greenland to the most northern point in about 83° 35′ north, he started north over the polar pack, but could only make good about 20 miles of ice travel before turning back in latitude 83° 54′ north. Though the North Pole was not reached, he made a valuable contribution to geography by the discovery that Greenland was an island.

In the following year, 1901, Peary again made the attempt to reach the pole by the Cape Hecla route, but was forced to abandon the attempt in April.

Still undismayed, Peary started again for the goal in February, 1902, proceeding from Payer Harbor to Fort Couger in twelve wonderful marches, and covering 400 miles in one month, with temperature ranging from—38°-57°. Leaving the land at Cape Hecla on April 6 with seven men and six dog sledges, he now surpassed all previous explorers and attained the highest latitude reached in the Western Hemisphere, 84° 17′ north latitude.

For the sixth time Commander Peary started on his quest for the pole in July, 1905, leaving New York in the *Roosevelt*, a powerful steamer with auxiliary sailing power, the first vessel to be built

in America for Arctic work, for which she was designed especially by the Commander. Fighting her way up through Kane Basin and Kennedy Channel by the Baffin Bay route, she reached Point Sheridan, on the north coast of Grant Land, where winter camp was made. Early the following spring he divided his force into four parties, each with its sledges and dogs, Eskimo drivers and hunters. This expedition is of such recent event that I need not remind you of it. Suffice it to say that now after having occupied points, "one on the most northerly point of Grant Land, and thus of the North American Archipelago; another on the most northerly point of Greenland, and the third on the northern point of Peary Land, the most northerly point in the world ever visited by man, he wins the pennant for highest north in latitude 87° 6′."

All this was a schooling for that "last great struggle to plant the American flag at the pole," the story concerning which the members of the National Geographic Society have been privileged to hear from our honored guest's own lips. Was there ever a campaign carried out after so much physical and mental effort as Peary's last? If, as Dr Lyman Abbott has said, its Commander has done nothing else, he has taught the youth of our country the lesson of hard work and perseverance to their everlasting benefit.

Remember the last and final effort of his life in this direction was based on an original design. As he says, "the Eskimos with their dogs are the factors that make the search for the pole feasible." He became one of the tribe—the leader of the tribe. They called him their father; he called them his children. A theme could be written on this one text, and yet how little it is understood except by those who have been Peary's companions.

Captain Bartlett told me that the Eskimos would follow the Commander as they would no other man under the sun; that they were afraid of the sea ice as a little child was of the sea water, but they would follow Peary anywhere; that there was not another living man that could get an Eskimo far away from the land; that even Peary had doubts on this subject at times, and he would say confidentially to his ever faithful assistant, Bartlett, "Are there any signs of desertions?" to which the latter would reply, with a strong voice but fearful heart, "Oh, no, don't think of it; they will follow you to the last," and so they did. I am satisfied that Bartlett was right—that while their love was tested to the extreme the Eskimos would follow Peary to the ends of the earth, but that they could be led by no other man more than "two sleeps" from land.

After returning from this last expedition I heard Peary say once, "I can never go again to the Arctic regions; I am getting too old," but his never-say-die grit overcame his yearning for the home life and rest he so much needed, and he is soon in training for the death struggle of his life. Acting under the laws of Congress, to the effect that as far as practicable all hydrographic work of the U. S. Coast and Geodetic Survey shall be done by naval officers, he was detailed by direction of President Roosevelt, the patron of all such efforts as Peary's, to that department to carry on hydrographic investigation in Arctic seas in association with the Peary Arctic Club of New York. And let me say here that the one sounding of 1,500 fathoms without reaching bottom made by Peary near the pole is worth to the country more than all the money expended in the entire expedition, but the great mass of scientific data accumulated in his 23 years of effort has enriched the land beyond the expenditure of any possible amount of money.

The last of Peary's campaigns was a masterpiece of strategy. His force was divided into four grand divisions, led by brilliant chiefs. We can hardly overestimate the value of this organization.

I would call your attention right here to the selection of Captain Bartlett for the command of his fourth division, the post of honor. Remember that this was the one man who alone was fully competent to take the *Roosevelt* from her ice

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anchorage at the farthest north of any previous navigation back to civilization with all her priceless cargo of Arctic heroes. To take the second in command from this important post for a forlorn hope was beyond the borders of rashness—it was tempting Providence. Read the story of the *Polaris* expedition, and you will find that by all good rights Bartlett should never have left his ship.

But overcome by his regard for his faithful assistant, by the knowledge of Bartlett's great value to the land party, as well as by his desire to do honor to our kindred race, living under the cross of Saint George, he was given the post of honor—the advance, when it meant that had the expedition ended at latitude 87° 48′ north, the second in command would become the first in honor, for he first reached this parallel two hours ahead of the main party. As it is, Bartlett hangs on his escutcheon "The Highest North" up to that time, to give away only to his chief in the still higher claim of "no north, no south, no east, no west."

Even if Peary dared do so, he could not have given the charge of his highly honored returning party to any other man under his command and do justice to those faithful children of his who were entitled to his protection. As far as a witness to Peary reaching the pole is concerned, if he needed one, he had the best one living—Hensen—a faithful colored man whose truthfulness had been tested in twenty-three years of manly and intelligent effort with his chief. Besides this, he was a man fully competent to at least record observations, and it is believed he could have made them himself.

I have often been asked what is Commander Peary's real title in the navy, and some have questioned the propriety of my calling him Commander. While Commander Peary is not a commander in the navy, he belongs to one of the most important and highly respected corps of the service—the Corps of Civil Engineers—and really outranks, or soon will do so, every commander in the navy.

However this may be, if, after being in command of the Peary Arctic expeditions for nearly twenty-three years, displaying the highest degree of executive and administrative ability, he is not a commander, then I do not know what the term implies.

The North Polar Arctic Expedition of 1908-1909, led by Commander Peary, was not a "dash to the pole," as it is popularly termed by the public, but was a grand campaign laid out on truly military lines like one of Napoleon's brilliant inspirations, and as original in conception as any of that great soldier's. Peary first went through a long span of years in the study of Arctic conditions and in the preparation of the force he was to handle. This, when ready, was followed by an advance of his lines from the east, and resulted in the discovery of the insularity of Greenland, and that the route to the pole was not landward. He then retreated to reconnoiter and find a weak point in his adversary's defenses. After a while he tried to blaze another trail, but was driven back by the elements, those great forces of nature before which man is impotent. While his advance here was made from a base west of the position first attempted, it led him into fields where the ice was broken, and the leads—"those nightmares of Arctic explorers," as Peary calls them—left him no recourse but to retreat again.

The final assault on the North Pole, the best defended and long resisting stronghold of nature, was begun from a point still farther west, where the land jutted out into the Arctic Sea of ice much nearer the pole than any other land from which an advance was possible. From here was begun that "last of the world's great stories" which so simply and modestly, and yet so graphically, has been told by him.

The forces were led up by divisions with marvelous precision and discharged their weapons, the only ones possible to use in this campaign—provisions—and then fell back, leaving the Commander on the one hundred and thirtieth-mile line to begin the real "dash to the pole." From this point began the "Charge of

the Light Brigade" that ended successfully a campaign comparable with those of Alexander, Napoleon, or Grant. Long after all of us have passed away, Peary's name will be emblazoned on the scroll of fame as one of the great commanders of the world.

THE TOASTMASTER

It is certain that in all the history of our Arctic exploration there is one commanding figure that stands out preëminent. It is fitting that now at this time I should give a brief recount of what will not be celebrated here tonight, but what is essential as we are step by step leading up to the honor of this great American.

He was born in Cresson, Pa., in 1856; was graduated from Bowdoin College in 1877; entered the United States Navy as civil engineer in 1881; was assistant engineer in the Nicaraguan Ship Canal under Government orders in 1884–85; was engineer in charge of the Nicaraguan Canal survey in 1887–88; in 1886 made a reconnaisance of the Greenland icecap; was chief of the Arctic expedition sent by the Academy of Natural Science of Philadelphia in 1891–92 to the northeast angle of Greenland; discovered and named Melville and Heilprin Land lying beyond Greenland; received the Patron's gold medal of the Royal Geographical Society of London and the medal of the Royal Geographical Society of Edinburg for determining the insularity of Greenland; made a study of the little Arctic islanders; in 1894 discovered three meteorites, one of which, the largest known to exist, weighed ninety tons; in 1896–97 brought these meteorites from Cape York to the United States. Commanded the Arctic expeditions under the auspices of the Peary Arctic Club of New York in 1898 to 1906, on which expeditions he rounded the northern extremity of Greenland Archipelago, the last of the great land groups, naming the most northerly land in the world, which is situated at 83° 39′ north latitude, and attaining the highest north at 87° 6′, for which he was awarded the Kane gold medal by the Philadelphia Geographical Society, the Daly gold medal of the American Geographical Society of New York, and the Hubbard medal of the National Geographic Society.

In 1908, under the auspices of the Peary Arctic Club of New York, in the good ship *Roosevelt*, commanded by that indomitable commander, Captain Bartlett, he again sailed for the north. No expedition ever was more perfectly planned or efficiently manned and officered. Why, it was the result of twenty years of a master mind, and the North Pole was reached on April 6, 1909. This was accomplished not only by the expenditure of tremendous physical energy, but by the employment of a high degree of intellect in planning to conserve this energy and to expend it so as to gain the greatest possible efficiency. In no other way could the North Pole ever be attained over land and over ice and water. The time may come—I believe it will come within a decade—when we shall fly over these regions that have seen so much heroic endeavor by the hardy men of nations whose representatives are gathered with us tonight, and I am of the opinion that this is the last great struggle to accomplish the pole overland.

But now, Commander Robert E. Peary, in presenting to you the special medal of the National Geographic Society, in recognition of an achievement that has brought honor to the American people, I wish to add that in all of your twenty years of heroic endeavor there has never been a time when any man associated with you, or any other person, has ever doubted your manly integrity or questioned for one moment your veracity. The American people were willing to believe that you had attained the pole by your simple statement. But science is critical. It accepts no word. It renders no decision without the proof.

And again I compliment you on the fact that before you received honors from any other source you diligently sought to present your credentials and to have them received and certified to by a competent tribunal. Those records were submitted—records made in the Arctic, not

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edited or prepared. I had the opportunity to meet with the committee and see the original data, and am satisfied that there was not an "i" dotted or a "t" crossed from the time the record was made, far away there in the cold fastnesses of the north. And so the decision was rendered in accordance with your claims.

And now, in presenting you with the medal of the National Geographic Society—which is voted to you by the representatives of more than fifty thousand people, thinking, active working people in the world, through its Board of Managers of twenty-four, representing nearly every type of scientific knowledge—I wish to say, sir, that in honoring you as the man we honor not only our Society, but—I speak for our guests—honor ourselves.

RESPONSE BY COMMANDER PEARY

President Moore, ladies and gentlemen of the National Geographic Society: I cannot tell you how deeply I appreciate the words of your President, how deeply I have appreciated the chivalrous, magnanimous speeches of those distinguished representatives of two great nations whose own men have done magnificent work in the Arctic regions, and who have kindly spoken here tonight; how much I have appreciated those clear, concise remarks of our greatest philanthropist; how much I have appreciated the friendly words of Admiral Chester.

Far deeper than words is my appreciation of this magnificent trophy, conveying the faith and approval of this great Geographical Society, and awarded in connection with the most extraordinary state of affairs that has ever happened in the entire history of exploration and discovery.

It is particularly appropriate that the greatest Geographical Society in the Western Hemisphere should be the first to officially recognize the winning of the last great geographical prize which the world had to offer, an accomplishment characterized by your distinguished committee as "the greatest which the Society can ever have opportunity to honor."

But mine is only a portion of the credit for which this trophy stands. Had it not been for the unswerving faith and backing (both moral and financial) of Morris K. Jesup, organizer and first President of the Peary Arctic Club; had it not been for the equally unswerving faith and backing of General Thomas H. Hubbard, the present President of the Club, and the members and friends of the Club who have furnished all the funds for the work; had it not been for the splendid loyalty, enthusiasm, energy, and endurance of the members of my party, from Captain Bartlett down, we should not have the North Pole here with us tonight.

As copartner with and representative and proxy for those whom I have mentioned, I accept your magnificent medal with feelings of the liveliest pride and gratification.

Permit me to convey to the Board of Managers of the Society, and through them to the Society itself, my own and my friends' acknowledgments for its instant perception and acceptance of the duties of its position, and its definite and courageous stand at a time when a stand for the truth meant becoming a target for the most virulent attacks from the ignorant, the vicious, and the deluded.

I wish also to convey the thanks of my friends and myself to that brother officer of superb personal and professional reputation, whose clear insight, constitutional hatred of a lie, and unanswerable arguments have done so much toward clearing the atmosphere, Admiral Chester.

Thinking men and officers accustomed to questions of personal and public duty and responsibility have understood matters from the first, and the public now appears to be grasping the fact that a navy officer does not often shirk a duty, and, when an officer of the United States Navy makes a deliberate statement concerning matters of which he has cognizance, that statement is, at all times and under all circumstances, to be taken absolutely at par.

The fundamental keynote of success in the last expedition of the Peary Arctic Club, which, on the 6th of April, 1909, discovered the North Pole, was *experience*.

If the pole could have been won by inexperience, or by a happy combination of fortuitous circumstances, it would have been won long ago.

Nor was it to be won by courage and endurance alone; if it were, England would have had the prize years ago, Norway would have had it in '95 when Nansen and Johansen cast themselves adrift into the unknown, and Italy would have attained it in 1900, when Abruzzi drove her colors to the front in spite of indescribable obstacles.

Accumulated experience, persistence, profiting by mistakes through a long series of years (the prime factors of success in any great work, whether it be the establishing of an enormous industry, the perfecting of a world-reaching invention, or the moulding of a nation)—these were the essentials which permitted the discovery of the pole by the last expedition of the Peary Arctic Club, and the essentials without which it cannot be reached again.

Let me call to your attention that the last expedition of the Peary Arctic Club had at its command the practical experience of twenty-three years of work in one field; that it had at its command a ship specially built for the work, after years of experience, tested in one voyage and then modified as the result of that test; that it had at its command a veteran personnel largely selected from the membership of a previous expedition; that it had at its command the pick and flower of the hardiest and most experienced men of an entire Eskimo tribe; that every item of its equipment was an evolution from years of experience and practical work in the same way that the last cup defender—and winner—was an evolution from preceding international yacht races, and that it had at its command the route to the pole that is recognized by all Arctic authorities as the shortest and best.

And then let me tell you that every atom of this specialized experience and equipment, every nerve of this veteran personnel, was not only utilized but *demanded* in the successful negotiation of the 413 miles of icy chaos, along the Cape Columbia route to the pole, *the route which is 100 miles shorter* EACH WAY *than any other route around the entire periphery* of the Polar Sea.

Here in this magnificent trophy of your great Society lies the final chapter of the last of the great geographical stories of the Western Hemisphere, beginning with the discovery of the new world, ending with the discovery of the North Pole.

Here is the cap and climax, the *finish*, the closing of the book on 400 years of history.

Here in this magnificent trophy of your great Society glitters the splendid frozen jewel of the north for which through centuries men of every nation have struggled and suffered and died—won at last and to be worn forever by the Stars and Stripes.

THE TOASTMASTER

The Board of Managers of the National Geographic Society have voted to Grove Karl Gilbert, a member of the National Academy of Sciences, and for many years an officer of the National Geographic Society, a Hubbard medal for his great achievements in geographic research during many years. Professor Gilbert is not here tonight, and his medal will be presented at a future time.

I shall introduce the Ambassador from Great Britain, one whom we all love so much and who has been with us before, to present to one of his own countrymen, Captain C. A. Bartlett, the medal for twice commanding the *Roosevelt*, and for being one of those heroic characters that have done so much to bring honor to our own nation and honor to that great nation of Great Britain.

THE AMBASSADOR FROM GREAT BRITAIN—HON. JAMES BRYCE

Mr Toastmaster, ladies and gentlemen: If it were not for the honorable duty that brings me to you tonight I should be very

much ashamed to appear before you at so late an hour as this. But I am comforted and encouraged by the reflection, as I introduce myself, that this is a thing which can never occur again. There will never be another occason in which a speaker will arise to present a medal to a man who has taken part in the discovery of the North Pole.

There is just one thought which in the midst of these festivities and congratulations weighs rather painfully upon me, ladies and gentlemen. For some centuries, as you have already been told, the discovery of the North Pole has been an object of curiosity, interest, and aspiration to all the civilized peoples of the world. They have thought about it, they have wondered when and how it would happen. A great German philosopher has observed that the pursuit of truth is even better than the possession of truth. Bold men were excited by the pursuit of the North Pole, and all the world was interested in following their deeds of daring. Now at last that pursuit has come to an end. The pole has been discovered. Commander Peary has found the pole. But the world has lost the pole. We have no longer this achievement to look forward to. The riddle has been solved, the curtain has been lifted, and was it fair to posterity to take away such an object of aspiration from it? I tremble to think, ladies and gentlemen, of what will happen when all the riddles of the earth have been solved and those countless generations that are to follow us have nothing that they do not know about this habitable globe of ours, a small globe, after all, too small for the restless and eager mind of man.

Now, having relieved my mind by this outburst of sadness, I come to the business which you have entrusted to my charge, and that is to present this medal to Captain Bartlett. It was a graceful and charming thought on your part, gentlemen of the National Geographic Society, that you should present this medal to Captain Bartlett, and I can assure you that it will be heartily appreciated in the good country to which Captain Bartlett belongs, and by those who, in other lands, on the shores of many seas, live under the British Crown. I thank you and the National Geographic Society for it. But you have already had an acknowledgment by cable from the President of the Royal Geographical Society—one who bears an honored name, for he is the son of the great Charles Darwin—of the pleasure which it has given to that oldest of the Geographical Societies of the world.

Now, Captain Bartlett belongs to an ancient and famous line of Arctic explorers who have sailed under the flag of England. That line begins with the ever to be honored name of Henry Hudson, who perished in the great bay that he discovered. And it is illumined by many an illustrious name thereafter, among whom perhaps the most famous is Sir Edward Parry, who made his wonderful advance toward the pole, far outstripping any who had gone before him; Sir John Franklin, Captains Ross and McClure, and McClintock, and many another of whom time would fail me to tell, dauntless spirits who bent their strength and their powers to the work of polar and Arctic exploration.

I remember seeing long, long ago, at meetings of the British Association and of the Royal Geographical Society in Britain, some of these ancient weather-beaten veterans of polar exploration, and I know how it would rejoice them now to think that that for which they labored had at last been achieved. And if you want to know that the gallantry which animated those men and which made them bear cold and hunger and ill-health, and face all the perils of snowy wastes and floating ice in the pursuit of discovery, if you want to know that that spirit lives still with undiminished force in men of British stock, you have only to read the lately published narrative of the gallant effort to reach the South Pole made by Lieutenant Shackleton and his comrades, which brought them within 97 miles of that remote and perious goal. This was done by the courage and hardihood of Lieutenant Shackleton.

Ladies and gentlemen, we are proud to think that the United States and Great Britain have been partners in this splendid work of Arctic exploration. The United States took up the work some forty years ago, and the names of Kane and Greely and others, above all of Commander Peary himself, show with what energy and spirit and courage and skill and perseverance you have pursued it.

But do not let us forget, in the pride which we feel in the achievements of the stock to which we both belong, what has been done by the other great nations of the world, to some of whose members reference has already been made, more particularly to the Duke of the Abruzzi, whose representative is present here tonight. Barentz must be remembered, and Weyprecht and Nordenskjöld. And there is another man whose wonderful feat of launching himself out upon the Arctic Sea and voyaging for many hundreds of miles upon ice floes is perhaps without parallel in history for its daring, and ought to be remembered in the presence of the Minister from Norway—I mean Dr Fridthjof Nansen.

Now, ladies and gentlemen, I have the great honor of being asked to present this medal of your Society to Captain Bartlett. You, Captain Bartlett, belong to a calling which has always been able to boast of a host of hardy and adventurous seamen. You have been, on your own grim, tempestuous coast of Newfoundland, accustomed to all the perils of storm and iceberg, and it is in the line of your calling to know how to deal not only with the dangers that icebergs threaten, but with all the other terrors that the northern seas contain. You belong to a family which has signalized itself even in your land by the number of gallant seamen it has produced. I may state that there are so many Bartletts who have made distinguished and successful voyages on the North Atlantic coasts that this one who we see here tonight is familiarly known by his Christian name. He stands out from the other Bartletts as Captain Bob. He has had ten years' experience sailing with Commander Peary as the captain of his ships in his various expeditions. And I want to tell you that in those years that Captain Bartlett was sailing there never was a man lost upon those ships in those expeditions.

Captain Bartlett, I have the honor to present to you this medal. Brave men are always generous, and Commander Peary with characteristic generosity has acknowledged how much he owes to you. Your name will go down along with his in connection with the discovery of the North Pole, and you have in this medal a trophy which you can pass on to those who come after you as a memorial of the honor, the well-earned honor, which the National Geographic Society has paid to you.

Ladies and gentlemen, I rejoice to think that Great Britain and the United States are associated on this occasion. And as we congratulate you, Captain Bartlett, so I venture on behalf of my country to congratulate you, Commander Peary, and you, citizens of the United States, upon this splendid achievement—an achievement which will stand alone to the end of time.

RESPONSE BY CAPTAIN BARTLETT

Mr President, ladies and gentlemen: I would ask you just to bear with me for about three minutes. I am afraid to trust myself in speaking, but I have a few words jotted down here that if you will not mind I will read off.

I have the medal that you have been kind enough to bestow upon me, and I thank you in my heart. To be thus decorated by so eminent a body as the National Geographic Society is an honor of which any man can justly feel proud. To say, however, that the notice which you have taken of me affords me pleasure of the most genuine sort would be to state only a part of the truth. I am more than pleased. I am deeply moved at your distinguished consideration. My happiness in receiving this honor at your hands is increased by the fact that I never expected it. It is as unexpected as it is pleasant. It may be also that my appreciation of this medal is enhanced by the

knowledge that its like can never be conferred again. It was struck off to memorialize a complete work, a work that is done, and well done. Commander Peary, with the pleasure that comes to me as I find myself in the midst of these honors, there comes the solid satisfaction of feeling that I have been of some assistance to a man of such sterling worth as Commander Peary (and I can look you straight in the eye, sir, and say that), a man whose heroic character and high aims make him quite worthy of the great fame that has come to him.

For the very great honor that you have shown me on account of my humble aid in the great work, I once again return my heartiest thanks.

THE TOASTMASTER

We have honored Commander Peary, but I am of the opinion that really the greatest honor that he has received tonight is when the captain of his ship said, "I can look you straight in the eye, sir, and say that. I mean it."

Now we shall have a word from General Thomas Hubbard, the President of the Peary Arctic Club, which has done so much for the accomplishment of the North Pole.

GENERAL THOMAS H. HUBBARD

Mr President, ladies and gentlemen: The extension of time granted by the President to the earlier speakers does not apply to me, and if it did I would not avail myself of it, seeing that Mr John Barrett is waiting to follow me, and I do not wish to cut off his time. But it would be ungracious on my part not to recognize the high honor paid by this Society to Commander Peary and Captain Bartlett, and it would be perhaps more ungracious to make a long speech in recognition of that honor and courtesy.

The Peary Arctic Club is a young institution. Commander Peary is a good deal older than the Peary Arctic Club. I do not mean to imply that he is older than each one of its individual members, but he is older than all of them put together in a corporate capacity. The Peary Arctic Club is eleven years old—an infant—and yet it has witnessed the departure and return of Commander Peary, first upon that long four years' absence in the north, when he came back and said he did not reach the pole; next, after the one year's absence, when he came back again and said he did not reach the pole. Either time he might have said that he reached it. There was nothing to contradict him. It would have been impossible to refute the statement. But each time he came back and said he did not do it. And now he has come back and has said that he did it, and your action, the action of this eminent Society, has approved his record.

The Peary Arctic Club has Commander Peary as its chief asset, and his honor is theirs. They have divided with him labor and danger. I know my hearers will say that in dividing labor the division has been unequal. He has done the labor and they have looked on, and I must admit that their attitude during his absence has been that of a passive trustee. During his presence his own activity has stimulated theirs. They were kept active before he went away this last time, and they have been made more or less active since his return.

I beg to assure you that their activity has not included any conspiracies, has not included any attempt to destroy life, or blow up vessels, or steal records. How far they have shared his dangers I can only say by repeating the conversation that I had with him when he sailed out of the East River July 6, 1907.

It was a frightfully hot day and thoughts of the pole were refreshing. As I shook hands with him he said, "Take care of yourself," to which I replied, "It is an injunction I should give you. You have got to take care of yourself." Then his answer was, "Oh, no. One who knows the conditions of life in the Arctic regions is safer than he is in New York."

Now Commander Peary has made life and work in the Arctic regions comparatively safe. No one can make it safe to travel hundreds of miles over an ocean not frozen, but covered with floes likely

at any time to be disrupted. But so far as the danger of starvation, the danger of loss of supplies, the dangers that have been fatal to former explorers—so far as these things are concerned, Commander Peary has made Arctic exploration safe.

Of the dangers to those who remained here I will not speak. All imagine what they are. They do not relate to Arctic exploration. They do not relate to ice, unless it is the ice trust, and they do not relate to water. In my opinion they relate chiefly to too abundant legislation. The other night I heard a statement from Professor McMillan, one of Commander Peary's companions, who said that the Eskimos were the happiest people in the world. Commander Peary says a trip up in the Arctic is safe as compared with the dangers of New York or of Washington. I think the reason for that happiness of the Eskimo and the comparative danger of those who live in the cities throughout the United States is that the Eskimos are not governed by any laws except the laws of nature, and we suffer from a trinitarian government—the trinity of the legislative, executive, and judiciary. How can a people be safe and happy when laws are passed at the rate of twelve thousand a year, and when one State legislature in recent years made in one session three hundred and seventy-eight new crimes? How is it possible for the public to escape being made criminals?

But I am traveling outside of the subject of Arctic exploration and will come back so far as to say that those who have shared with Commander Peary the labor and the danger are entitled to some of the rewards. What are the rewards? The reward of the Peary Arctic Club is the great unparalleled achievement of Commander Peary, Captain Bartlett, and their companions, and that is sufficient to satisfy the ambition of the Peary Arctic Club and friends of the Commander. The recognition that he has received is not yet complete. His return has been met with some disappointments, but he must remember, as we all may, that such is the fate of explorers. Christopher Columbus at one time was sent a prisoner and in chains from the land he had discovered to the land that he had so much honored. Commander Peary has not been put in chains. In centuries to come his achievement will be recognized, and in behalf of the Peary Arctic Club I thank the members of the National Geographic Society that they have not waited for the lapse of centuries before recognizing the acts and the achievement of Commander Peary.

THE TOASTMASTER

We approach the South Pole from South America, and in closing this meeting I shall ask Mr Barrett to pronounce the benediction.

MR JOHN BARRETT, DIRECTOR OF THE INTERNATIONAL BUREAU OF AMERICAN REPUBLICS

Mr President, ladies and gentlemen: In memory of the lateness of the hour I congratulate President Moore and the officers of this Society and Commander Peary upon the significance and success of this banquet. I have only one observation to make, and that is, let us remember with reference to the future that the North Pole is not the only pole; that there is also a South Pole; that there is a great southland as well as a northland, an Antarctic as well as an Arctic Circle. And may we all gather here, possibly in a year or two years, to present a medal to that hero who shall discover the South Pole, whether he carry the flag of the United States, of Great Britain, or Italy, or France, or of that country which may produce a hero who may emulate the example of Robert E. Peary.

The members and guests present were:

Commander R. A. Ackerman, U. S. N.
Mr A. Aaronsohn
Mr and Mrs C. H. Ackert
Dr S. J. Allen
Mr D. G. Ambler
Representative Daniel P. Anthony, Jr., of Kansas
Mr Henryk Arctowski
Mr C. C. Arosenene, the Minister of Panama
Mr J. A. Aspinwall
Mr and Mrs O. P. Austin
Senator Augustus Bacon, of Georgia

Mr Harwood Bacon
Mr Thos. S. Baker
Mr Chas. B. Bailey
Admiral and Mrs G. W. Baird
Mr and Mrs Samuel N. Barker
Mr John Barrett, Director International Bureau of American Republics
Mrs Kate Walker Barrett
Representative and Mrs Richard Bartholdt, of Missouri
Captain Robert Bartlett
Dr L. A. Bauer, Director Department of Terrestrial Magnetism, Carnegie Institution
Mr Geo. H. Beaman
Mr Edwin C. Beers
Dr Alexander Graham Bell
Miss Aileen Bell
Mr Chas. J. Bell, President American Security and Trust Co.
Mr Gardiner Bell
Mr and Mrs Ira Bennett
Mr and Mrs John G. Bennett
Representative and Mrs Wm. S. Bennet, of New York
Mr and Mrs C. K. Berryman
Mr Ambrose Bierce
Mrs Robert Biggs
Lieutenant F. C. Billard
General John C. Black, Chairman Civil Service Commission
Mr Victor S. Bloeke
Colonel and Mrs H. F. Blount
Mrs Bertha H. Bohm
Captain H. T. Boin
Mr and Mrs Scott C. Bone
Rear Admiral R. B. Bradford, U. S. Navy
Mr Chas. S. Bradley
Mr J. A. Breckons
Mr Stacy H. Briant
Mr Robert Brott
Miss Brooke
Mr and Mrs Wm. A. Browne
Prof. E. F. Brusie
Miss Mary Bryant
The Ambassador of Great Britain and Mrs Bryce
Mrs J. Annen Bryce
Miss Bryce
Mr S. S. Burkett
Senator and Mrs Burkett, of Nebraska
Representative Albert S. Burleson, of Texas
Mr and Mrs W. K. Butler
Mr and Mrs Chas. Henry Butler
Minister of Costa Rica and Madame Calvo
Speaker Joseph G. Cannon, of Illinois
Miss Cannon
Mrs Carmody
Mr and Mrs J. W. Carnahan
Mr Frank G. Carpenter
Mr Fred W. Carpenter, Secretary to the President
Representative and Mrs Champ Clark, of Missouri
Mr Lucien W. Chaney
Admiral and Mrs C. M. Chester, U. S. Navy
Miss C. J. Christiansen
Mrs King Church
Mr W. A. H. Church
Mr and Mrs Price C. Claflin
Miss Margaret Claflin
Mr C. T. Clagett
Mrs Wm. E. Clark
Mr and Mrs B. M. Clinedinst
Representative Wm. W. Cocks, of New York
Mr H. G. Cole
Mr and Mrs Wm. Knowles Cooper
Mr F. V. Coville
General Wm. R. Cox
Mr and Mrs Elijah S. Cowles
Mr H. McC. Crist
Colonel Knowles Croskey
Mr J. M. Culp
Miss Helen M. Cummings
Mr and Mrs J. Harry Cunningham
Senator and Mrs Chas. Curtis, of Kansas
Mr and Mrs Wm. E. Curtis
The Minister of Chili and Madame Cruz
Miss Ida M. Daly
Mr and Mrs Oscar K. Davis
General Geo. W. Davis
Miss Elsie A. Davis
Mr Walter I. Dawkins
Mr Chas. Ray Dean
Mr Emile Diebitsch
Mr Wm. W. Doll
Miss Bertha L. Doty
Mr D. Wallace Duncan
Mr Geo. M. Dunn
Mr and Mrs Albion M. Dyer
Miss Dyer
Mr John Joy Edson, President Washington Loan and Trust Co., and Mrs Edson
Mr and Mrs Fred'k B. Eichelberger
Mr W. A. F. Ekengren, Secretary Swedish Legation
Mr and Mrs J. F. Ellerson
Miss Elliott
Mr and Mrs Edward S. Ellis
Mr Fred A. Emery
Miss Emery
Colonel R. K. Evans, U. S. A.
Mr David Fairchild
Mr Romolo Fanciulli
Mr and Mrs Richard Lee Fearn
Captain and Mrs A. J. Fechleter
Mr and Mrs W. W. Finley
Mr and Mrs Guy Finney
Senator and Mrs Fletcher, of Florida
Miss Louise Fletcher
Miss Nellie Fletcher
Mr Loring Fletcher
Miss Myra B. Floyd
Representative and Mrs David J. Foster, of Vermont
Representative and Mrs Geo. E. Foss, of Illinois
Mr Geo. S. Fowler
Mr and Mrs H. B. Fulton
Mr and Mrs H. M. Fulton
Mr F. A. Furst
Senator and Mrs Robert J. Gamble, of South Dakota

Mr Henry Gannett, Vice-President National Geographic Society
Mr H. E. Gerhard
Mrs Gibson
Miss Laura D. Gill
Representative Fred'k H. Gillett, of Massachusetts
Miss Lucy D. Gillett
Mrs H. A. Gillis
Mrs H. P. Godwin
Mr J. F. B. Goldney
Mr Samuel Gompers, President American Federation of Labor
General and Mrs Green Clay Goodloe
Prof. and Mrs J. Howard Gore
Mr Horace S. Gould
Mr John Graham
Mr O. R. Graham, Jr.
Mr J. T. Granger
Mr Benj. S. Graves
Mr Gilbert H. Grosvenor, Editor NATIONAL GEOGRAPHIC MAGAZINE
Mr Edwin P. Grosvenor
The Minister of Norway and Madame Gude
Mr W. B. Hadley
Mr Henry J. Haight
Miss Adelaide Haffords
Colonel Thos. H. Handbury, U. S. A.
Mrs Geo. A. Hart
Representative G. N. Haugen, of Iowa
Representative William H. Heald, of Delaware
Mr G. F. Heilprin
Miss Heilprin
Mrs Helmbold
Mr J. B. Henderson, Jr.
Mr Calvin W. Hendrick
Hon. and Mrs Robert L. Henry
Mr Hilary A. Herbert, formerly Secretary of the Navy
Mrs Geo. G. Herring
Mr and Mrs Arthur Herschel
Mr and Mrs C. Heurich
Miss Hickey
Representative and Mrs Ebenezer J. Hill, of Connecticut
Mr Samuel M. Hitt
General and Mrs Charles W. Hobbs
Miss Hobbs
Admiral and Mrs R. C. Hollyday, U. S. N.
Mr and Mrs E. M. Hood
General Thomas Hubbard, President Peary Arctic Club
Mr A. J. Huntoon
Mr Geo. W. Hutchison
Mr Frederic B. Hyde
Admiral Richard Inch, U. S. N.
Mr Alfred Mitchell Innes
Mr H. R. Insley
Lieutenant Colonel and Mrs R. B. James
Mr Mahlon H. Janney
Mr Chas. G. Jarboe
Mr and Mrs Carl F. Jeansen
Mr William Jessop
Mr and Mrs C. A. Joerissen
Mr B. F. Johnson
Mr Maurice Joyce
Mr and Mrs George H. Judd
The Ambassador of France and Madame Jusserand
Mr and Mrs Gus Karger
Mr and Mrs Rudolph Kauffmann
Mr and Mrs H. W. Kennard
Mr Clarence P. King
Mr and Mrs Geo. A. King
Hon. Martin A. Knapp, President Interstate Commerce Commission, and Mrs Knapp
Representative and Mrs J. R. Knowland, of California
Mr and Mrs Geo. C. Knowles
Dr Geo. M. Kober
Mr and Mrs John Oliver La Gorce
Representative John Lamb, of Virginia
Mr James L. Lancaster
Miss Helen Landell
Mr and Mrs John B. Larner
Mr B. F. Leighton
Mr Wm. B. Levy
Mr and Mrs Thos. W. Lockwood, Jr.
Mr Homer N. Lockwood
Mr and Mrs Edward H. Loftus
Representative and Mrs H. C. Loudenslager, of New Jersey
Mr and Mrs Edw. Lowry
Mr Craig McDonald
Senator McEnery, of Louisiana
Mr W J McGee
Mr and Mrs Percy McKay
Mr and Mrs Chas. A. McKenney
Mr and Mrs F. D. McKenney
Dr R. E. B. McKenzie
Representative Wm. B. McKinley, of Illinois
Mr N. E. S. McLean
Dr Malcolm McLeon
Mr and Mrs John H. Magruder
Miss Natalie Magruder
Mrs I. T. Mann
Representative and Mrs James R. Mann, of Illinois
Mr W. Sinkler Manning
Mr E. R. Martin
Mr Crittendon Marriott
The Charge d'Affaires of Japan and Madame Matsui
Mr Wm. F. Mattingly
Miss Mattis
Mr and Mrs Wm. A. Mearns
Mr H. G. Meen
Senor Don Merino, Secretary Spanish Legation
Mr and Mrs R. F. Miller
Mr Russell Hastings Millward
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THE COAL-FIELDS OF ALASKA*

With a Few Notes on the Mineral Wealth of the Territory

THERE are two known areas of high-grade coal—the Bering River field, in the Controller Bay region, and the Matanuska field, north of Cook Inlet. The Bering River field, lying about 25 miles from tidewater at Controller Bay (see map, page 24), embraces 26.4 square miles underlain by anthracite and 20.2 square miles underlain by bituminous coal. The coal-bearing rocks trend to the northeast into the unsurveyed high ranges, and it is quite possible that there may be an extension of the coal-fields in this direction.

Coal-beds varying from 6 to 20 feet in thickness are exposed in this region, with some local swellings, giving a much higher maximum thickness. In quality the coals vary from an anthracite, with 84 per cent of fixed carbon, to a semi-bituminous, with 74 per cent of fixed carbon, and include some varieties that will coke. There has been much prospecting of these coals, but in the absence of railways no mines have been developed, though a small output from one bed has been taken to the coast in barges.

The Matanuska coal-field lies about 25 miles from the tidewater at Knik Arm, a northerly embayment of Cook Inlet. As Cook Inlet is frozen during the winter, however, the distance to an open seaport must be measured to Resurrection Bay, on the east side of Kenai Peninsula, about 150 miles from the coal-field (see map, page 3).

The known commercially valuable coals of the Matanuska field vary in quality from a sub-bituminous to a semi-bituminous, with some anthracite, and are included in folded and faulted Tertiary (Eocene?) shales, sandstones, and conglomerates, aggregating 3,000 feet in thickness.

The coal-beds vary from 5 to 36 feet in thickness, and the total area known to be underlain by coal aggregates 46½ square miles. However, as much of the field is covered by gravels and none of it has been surveyed in detail, the coal-bearing area may be much larger. The total area of what may prove to be coal-bearing rocks is approximately 900 square miles. Up to the present time there has been no means of transporting this coal to market, so that no mining has been done, but many beds have been opened in prospecting.

The anthracite from Matanuska and Bering rivers has no equivalent on the Pacific Coast, and it compares favorably with the Pennsylvania anthracite. It ought to be put into the San Francisco and other Pacific Coast markets at a cost far below that of Eastern coal, in which case it should have no difficulty in entirely supplanting the latter.

The Bering River semi-anthracite and part of the semi-bituminous coal from Matanuska is also better than anything that is being mined in the West. These coals are the equivalent of the Pocahontas, New River, and Georges Creek coals of the East, and are eminently adapted for use on warships and for other purposes for which a high-grade, pure, "smokeless" steaming coal is required, and for these purposes will command a considerably higher price than any coal now being mined on the Pacific Coast, or, if offered at equal prices, should readily drive the latter from the market.

Part of these coals will produce an excellent quality of coke—better, in fact (except possibly in content of phosphorus, regarding which no data are available), than coke which can be pro-

* From reports of Alfred H. Brooks, Chief of Alaskan Division, U. S. Geological Survey.

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duced from any of the Washington or Vancouver Island coals, and equal to the coke from Crow's Nest Pass. If an important smelter industry grows up in Alaska, as now seems possible, the Alaska coking coals should have the advantage, both of quality and of transportation.

Before they can be mined it will be necessary to build about 150 miles of railroad to reach the Matanuska coal, and from 25 to 100 miles (according to the harbor chosen) to reach the Bering River coal. It is believed that either of these projects is feasible, and that if favorable title can be obtained both fields will be producing on a large scale within a few years. Railroads are now under construction to both these fields.

Mining developments in the Bering River coal-fields of the Controller Bay region and in the Matanuska coal-field of the Cook Inlet region have been practically confined to surveys for patents, assessment work, and trail building. The most important features are connected with the problem of railway construction.

No patents for coal land have yet been granted.

The value of these high-grade fuels of Alaska probably exceeds that of the gold deposits, and the exploitation of these coal-fields is of the greatest importance to the entire western seaboard of the continent. These coals will furnish not only the high-grade steam coals needed for various industries, but also the coke for metallurgical enterprises. If the iron ores of the Territory prove valuable, the west coast may yet be supplied from this source with the raw materials for the manufacture of iron and steel. In any event, the copper smelters can be provided with coke of a high grade.

The coals from other known Alaska fields than these are so situated or are of such quality that they can find markets only where excessive rates on outside coals give them an advantage; that is, their markets must be local and probably small. These lignites and lower grade bituminous coals have a wide distribution in Alaska, and some of them will have great value to local industries.

GREAT QUANTITIES OF PEAT

Peat is very widely distributed in Alaska, having been found in nearly every part of the Territory. The climatic conditions, as well as those of plant life, in the central and northern parts of the Territory, seem especially favorable for the accumulation of peat. Everywhere the soil is clothed with a dense growth of moss and other small plants, and the frozen condition of the subsoil and the shortness of the summer season prevent decay.

There is no information at hand on which to base an estimate of the available supply of peat in Alaska. As it is found in every part of the Territory, however, and as the great tundras of the north, occupying at least a quarter of the Territory, appear to be nearly everywhere underlain by peat of greater or less thickness, the supply must be enormous, and may equal if not exceed that of the entire United States.

In the presence of more easily available fuel there has been no occasion to utilize any of the peat deposits, so that little is known of their horizontal extent or thickness. It is not uncommon, however, to see thicknesses of 15 to 30 feet in natural or artificial exposures. The surface layer of peat, which forms the upper layer of the tundra, may not exceed a few feet in thickness, but locally these accumulations are many times as thick.

COPPER AND PLACER MINING

Alaska contains a large variety of mineral deposits, and these, especially gold and coal, are widely distributed. The auriferous gravels are scattered over a very large area, but much of it is unprospected. There are some large auriferous lode mines in southeastern Alaska and promising lode prospects in other parts of the Territory.

Copper mining has been done in two widely separated coastal districts. Very promising deposits of copper ore occur

in two inland belts which are undeveloped because they are not yet accessible by rail, and copper prospects have been found elsewhere in the Territory.

Tin, marble, gypsum, and petroleum have been produced from Alaskan deposits; iron and other minerals probably have future commercial value.

Mining began about 1880 and progressed slowly for nearly two decades, since which advancement has been very rapid. Much of the Pacific seaboard, with its cheap transportation, strong relief, abundant water-power and timber, and equable climate, is most favorable to low costs of mining. These conditions have resulted in the development of one of the largest low-grade gold-mining enterprises in the world, as well as some others of considerable magnitude. They have also favored the successful exploitation of comparatively low-grade copper ores, even at the low market value of the metal during the past year.

Though placer mining has been carried on in Alaska for nearly thirty years, it has been chiefly by the crude methods of the pioneer that more than $100,000,000 worth of gold has been won from the auriferous gravels. The modern epoch of placer mining, with labor-saving machinery, has only just begun, and the field in which such methods are used is capable of much expansion. Though the future discovery of bonanzas, such as have made Alaska famous in the past, cannot be predicted, it is certain that the possibilities of new finds are far from being exhausted, and that there are hundreds of creeks known to be auriferous which may yield gold in commercial quantities when means are found to reduce the present cost of operation.

The inland copper districts await the railway transportation, which will not only lead to the development of known deposits, but also stimulate further search for ore bodies. Such developments of a lode-mining industry will give a larger permanent population—at present Alaska's greatest need.

A full development of the mining industry of Alaska is possible only by the improvement of the transportation facilities. At least one railway must be built to the Yukon gold-fields, and the inland copper-lode districts and coal-fields must be connected with Pacific ports that are open throughout the year. Then, and not until then, can Alaska's mining industry be developed to the extent warranted by her known mineral wealth.

IMMENSE MINERAL OUTPUT

The total value of the mineral production of the Territory since productive mining began, in 1880, exceeds $147,000,000. In the following table the production by years and by substances is presented. This table is based on the best available information, but accurate statistics of the annual mineral output have been collected only since 1905:

Value of Total Mineral Production of Alaska, 1880–1908

BY YEARS

1880–1890	$4,686,714
1891	916,920
1892	1,096,000
1893	1,048,570
1894	1,305,257
1895	2,386,722
1896	2,980,087
1897	2,538,241
1898	2,585,575
1899	5,703,076
1900	8,238,294
1901	7,007,398
1902	8,400,693
1903	8,941,614
1904	9,567,535
1905	16,478,142
1906	23,375,008
1907	20,887,055
1908	19,929,800
	$147,972,701

BY SUBSTANCES

Gold	$142,030,637
Silver (commercial value)	1,120,562
Copper	4,265,136
Tin	92,640
Coal	315,079
Marble and gypsum	148,647
	$147,972,701

The known mineral wealth of inland Alaska is embraced in the two copper-bearing belts of Copper River, lying 100

to 300 miles from tidewater; the Bering River coal-field, 25 miles from the coast at Controller Bay and 100 miles from a good harbor on Prince William Sound; the Matanuska coal-field, 150 miles from an ice-free port on the Pacific, and the Yukon placers, from 400 to 600 miles by feasible railway routes from the Pacific. This inland region is separated from the Pacific tidewater by high, snow-covered ranges, broken, however, by several river valleys.

The full development of the mineral wealth of inland Alaska must await improvements in means of communication, which will need to be of a very radical character. The expensive and uncertain mode of reaching the Yukon placer districts by ocean and river boats or long winter sled journeys places so heavy a tax on the gold-mining industry as to make it in most places impossible to exploit anything but the richest placers. The copper deposits of Copper River and the coal-fields of Controller Bay and the Matanuska basin must remain unproductive until a transportation system has been developed.

Thanks to the Alaska road commission, and in a lesser degree to local enterprise, much has been accomplished in the way of road and trail building. Much, however, remains to be done, for in this Territory, embracing nearly 600,000 square miles, there are only 452 miles of wagon road, 397 of sled road, and 255 of trail. The coastal service of ocean vessels and the river transportation systems of the Yukon and its tributaries are being much improved. In addition to this, steamboats have been placed on Copper and Sushitna rivers. Local transportation facilities have also been greatly bettered by short lines of railway, such as those at the White Pass, at Fairbanks, in Seward Peninsula, and the Copper River Railway, which now extends from Cordova for about 70 miles inland.

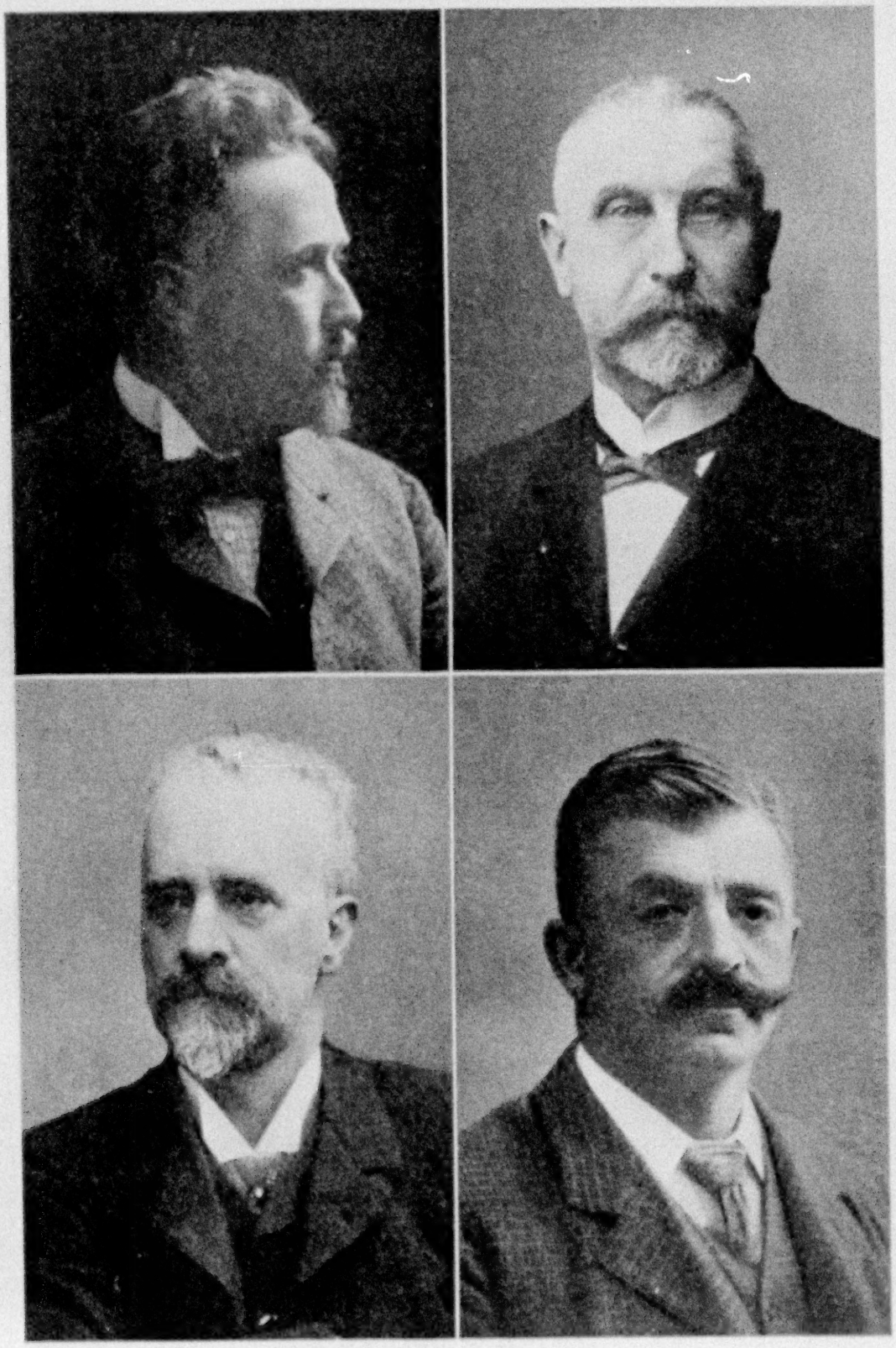
All these improvements in means of communication, together with the military telegraph lines, wireless stations, and long-distance telephone systems, have

COMMANDER JENSEN

OBSERVATOR PECHÜLE

Two members of the committee appointed by the University of Copenhagen to pass on Cook's claims of having reached the North Pole

done much to advance the mining industry. They can, however, be regarded only as supplementary to a system of railways, which alone can make available the mineral wealth of extensive areas. In fact, they serve to emphasize the inadequacy of the existing transportation systems. The industrial demands for better communication can be met only by railways which shall connect the mineral deposits with open ports on the Pacific seaboard.



PROFESSOR STRÔMGRÉN
OBSERVATOR ENGSTRÔM
COMMANDER HOLM
CAPTAIN RYDER

The other four members of the committee appointed by the University of Copenhagen, which examined the papers of F. A. Cook, and unanimously reported that Dr Cook had no proof that he had reached the North Pole.

ACKNOWLEDGMENTS

THE National Geographic Society has much pleasure in expressing its thanks and appreciation to the following companies and individuals for material assistance rendered to its Alaskan Expedition of 1909:

Borden's Condensed Milk Company, 108 Hudson St., New York, N. Y.—Condensed and evaporated milk.

Northern Steamship Co. *Lindsay*, Seattle, Wash.—Half rates, Cordova to Seattle.

Bausch & Lomb Optical Co., Rochester, N. Y.—Loan of 2 pair field glasses, 2 lenses for large camera.

Winchester Repeating Arms Co., New Haven, Conn.—Fifty per cent discount on shotgun, carbine, and ammunition.

Armour & Co., Chicago, Ill.—Extract of beef.

Keuffel & Esser, New York, N. Y.—Double mounted paper for plane table work.

Franco-American Food Co., Franklin St. and Central Ave., Jersey City, N. J.—Soups.

Eastman Kodak Co., Rochester, N. Y.—Discount on photographic equipment.

Williams Bros. Co., Detroit, Mich.—Canned goods, preserves, and pickles.

Schwabacher Grocery Co., Seattle, Wash.—Discount on groceries.

Merrill-Soule Co., Syracuse, N. Y.—Trumilk and truegg.

Katalla Company and Copper River and Northwestern Ry. Co., Cordova, Alaska.—Transportation, subsistence, maps, etc., for R. S. Tarr and Lawrence Martin.

W. and L. E. Gurley, Troy, N. Y.—Discount on topographic equipment.

Alaskan Division U. S. Geological Survey.—Maps and information, loan of instruments and assigning topographer.

U. S. Coast and Geodetic Survey.—Loan of instruments.

U. S. Bureau of Fisheries, Washington, D. C.—Loan of small sounding reel.

Jack Dalton, Cordova, Alaska.—Loan of boat, etc.

THE NATIONAL GEOGRAPHIC SOCIETY

THE Annual Meeting of the National Geographic Society occurred Friday evening, January 14. Reports of the Secretary and Treasurer were submitted and are printed below. The eight members of the Board of Managers whose terms expired at the meeting were unanimously re-elected for the ensuing three years, namely, Henry F. Blount, C. M. Chester, F. V. Coville, John E. Pillsbury, Rudolph Kauffmann, T. L. Macdonald, Willis L. Moore, and S. N. D. North.

At a regular meeting of the Board of Managers, January 19, Mr Henry Gannett, who has been Vice-President of the Society for the past five years and Chairman of its Committee on Research, was unanimously elected President; Mr O. H. Tittmann, Superintendent of the United States Coast and Geodetic Survey, was elected Vice-President, and Messrs O. P. Austin and John Joy Edson re-elected Secretary and Treasurer respectively.

REPORT OF SECRETARY O. P. AUSTIN FOR THE YEAR 1909

The year 1909 shows a large increase in the membership of the National Geographic Society and a general improvement in its condition and work. The number of members at the beginning of the year was 38,696, the number added upon their own application during the year was 18,152, and the losses by death and resignation 3,515, making the net increase during the year 14,637, and the total membership on December 31, 1909, 53,333, of which number 348 are life members.

This large increase in membership and consequent increase in the receipts of the Society has enabled it to give its members a larger and better Magazine, a material increase in the number of popular lectures, and to also set aside a considerable sum as a permanent investment.

The membership is distributed through all the States and Territories of the Union, and includes about 2,363 in the District of Columbia and between 600 and 700 in the Philippines, Hawaii, and Alaska. The membership in foreign countries is over 2,383 and represents fifty different countries and colonies of the world, including all the European countries, Egypt, India, China, Japan, Korea, Australia, New Zealand, the various South American countries, and several of the West Indian islands. The membership in Canada is 655; in Mexico, 391; in the Hawaiian Islands, 266; in

the Philippines, 203; in Alaska, 204; in Porto Rico, 59; in Cuba, 109; in Panama, 96; in Europe, 365, and in Central and South America, 118.

The Annual Dinner of the Society was held at the New Willard Hotel on December 15, and was largely attended.

It is with much regret that the Secretary records the death of Mrs Gardiner Greene Hubbard, October 20, 1909. The handsome building which she and her family presented to the Society and her constant interest in and assistance of the work of the Society from its organization, in 1888, have been keenly appreciated by every member of the Society. The following resolution was adopted by the Board of Managers on behalf of the Society, October 23, and sent to the family of Mrs Hubbard as an expression of the sympathy of the Society in their mutual affliction:

"The death of Mrs Gardiner Greene Hubbard is to the National Geographic Society a great, an irreparable loss, and to each member of the Board of Managers comes as a personal bereavement. Her broad and constant interest in the work of the Society, apparent during the decade in which her husband, Gardiner Greene Hubbard, served as its President, has, since his death on December 11, 1897, been its greatest stimulus to renewed activity in the work to which he devoted so many years and for the conduct of which he, twenty-one years ago, became the Society's first President. Her personal interest in its work in behalf of scientific geography and the diffusion of geographic information among the people, her attendance upon its meetings during the long years of its activities, and her individual recognition of the work performed by others in its behalf have been an inspiration to the officers of this Society, the members of the Board of Managers, the speaker upon the platform, and the Editor at his desk; while her splendid gift of a building which became at once a home for the Society and a memorial to its founder and first President now becomes of added interest as a memorial of her own generosity and a practical aid in the diffusion of information to all parts of the country and to all quarters of the world."

O. P. Austin,
Secretary.

Report of the Treasurer, John Joy Edson, for the Year 1909

RECEIPTS

Cash balance as shown by statement of December 31, 1908		$24,533.82
Dues from members		89,782.02
Life members		2,700.00
Magazine, subscription and sales		9,088.01
Lectures, tickets		5,222.50
Advertising in Magazine		10,233.58
Interest on investments	$812.50	
Interest on deposit in bank	598.13	
		1,410.63
Publications		8,620.69
Grant Squires Medal Fund Endowment		500.00
Sundry		1,848.27
		$153,939.52

DISBURSEMENTS

Salaries, clerical hire, and services		$18,371.39
Magazine, paper, printing, etc		52,451.27
Pound rate postage on Magazine		3,200.00
Postage		6,575.00
Printing and stationery		8,608.79
Lectures		5,089.69
Hubbard Memorial Hall, lights, heat, furniture, etc		1,316.65
Publications:		
Printing, binding, etc.	$10,246.36	
Postage and expressage	913.02	
		11,159.38
Research Committee, Alaskan Expedition	$5,496.39	
Research Expedition to Naples and Sicily	250.00	
		5,746.39
Investments:		
Purchase of lot on 16th St.	$11,338.95	
Notes, secured by real estate	15,000.00	
Accrued interest on same	300.00	
		26,638.95
Advertising, commissions		716.18
Sundry		3,451.28
Cash, on deposit in the Washington Loan & Trust Company		10,614.55
		$153,939.52

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ASSETS, DECEMBER 31, 1909

Notes secured by first deed of trust on real estate	$30,500.00
Publications on hand, at cost	7,000.00
Real estate, adjoining 28½ feet on 16th St. (purchase price)	11,338.95
Cash, on deposit in the Washington Loan & Trust Company	10,614.55
	$59,453.50
Liabilities, December 31, 1909	none

Respectfully submitted,

JOHN JOY EDSON,
Treasurer.

THE NEW YORK AQUARIUM

THE New York Aquarium had a greater number of visitors during the year 1909 than ever before, the attendance being 3,803,501—an average of 10,417 a day.

These figures show that the Aquarium has a greater patronage by the public than all the other museums of the city, including the Zoological Park, combined, and 1,800,000 more, for the same period, than the New York Hippodrome, which has probably the largest attendance of any theater in the city. These figures are unequaled by those of any other museum in the world of which statistics are available.

C. H. TOWNSEND,
Director.

Photo from Rev. B. St. John

A CAKE STAND: PEKING, NORTH CHINA

The carved tube is a piece of bamboo into which the cash is thrown as purchases are made

Waltham Watches At The North Pole

"WHERE ACCURATE TIME WAS THE ESSENTIAL FEATURE"

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November 20th, 1909.

WALTHAM WATCH COMPANY,
Waltham, Mass.

Gentlemen: Waltham Watches were used during my expedition in connection with the simultaneous tide observations at Cape Sheridan, Cape Columbia and Cape Bryant, *where accurate time was the essential feature.* They were also taken on sledge expeditions north over the ice.

Watches were distributed to different supporting parties, and were used for time comparisons by the parties up to the point where Marvin returned in command of the third supporting party.

As further simultaneous tide observations were contemplated between Cape Sheridan and Cape Morris Jesup—the most northern point of Greenland—Marvin took with him the five Waltham Watches in the party for this purpose, the object being that comparison of the five different watches might give us absolute certainty of correctness of our time.

The performance of the watches in connection with the tide observations was entirely satisfactory.

Very truly yours,

(Signed), R. E. PEARY.

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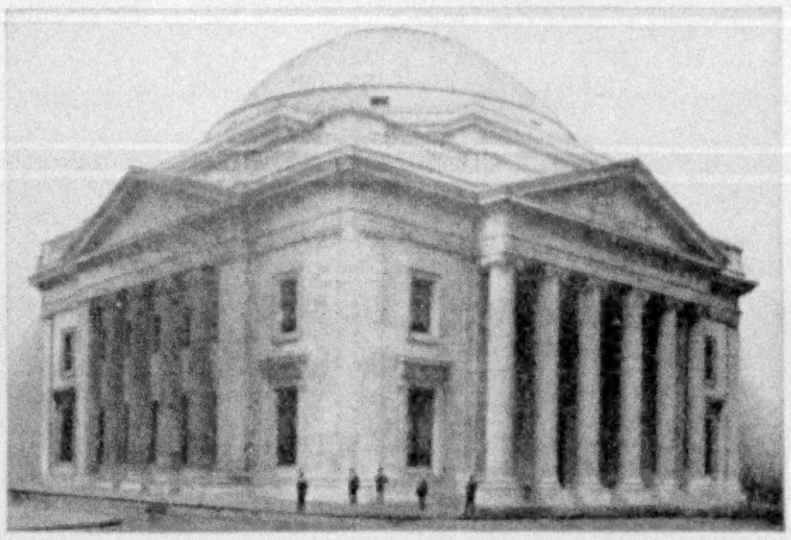

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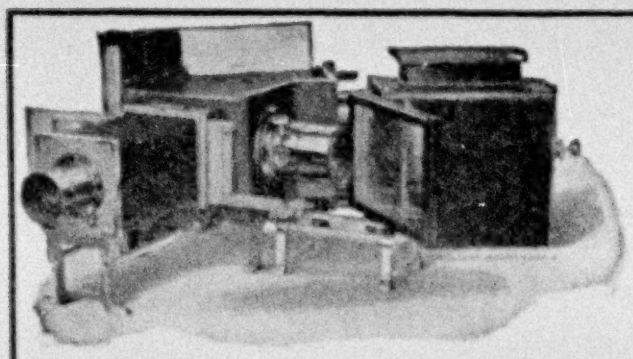

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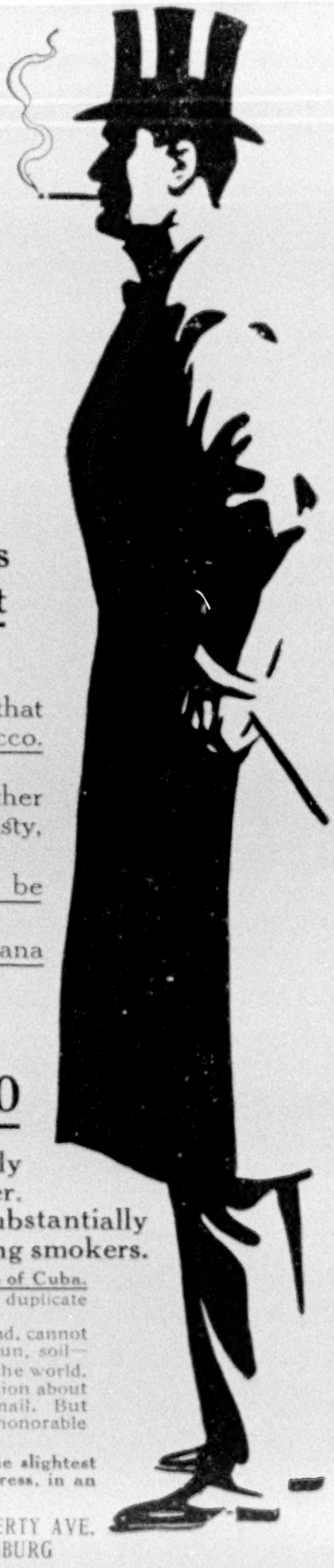

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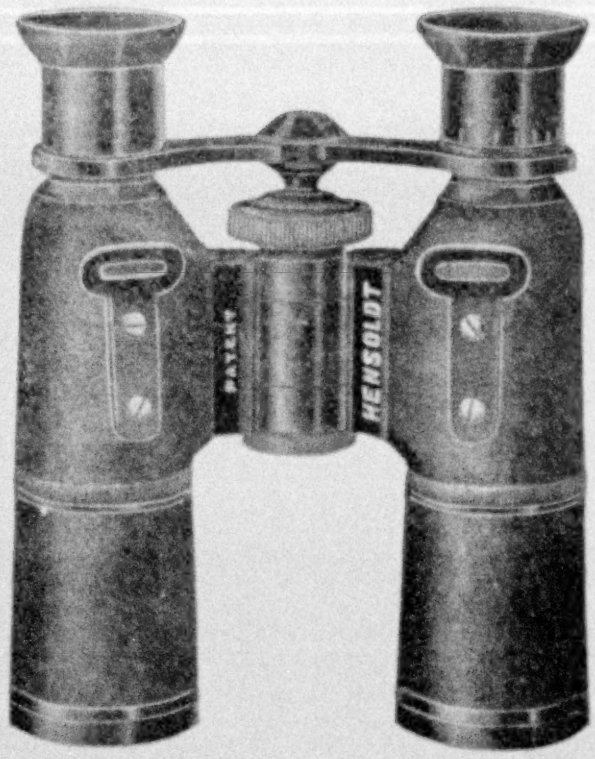

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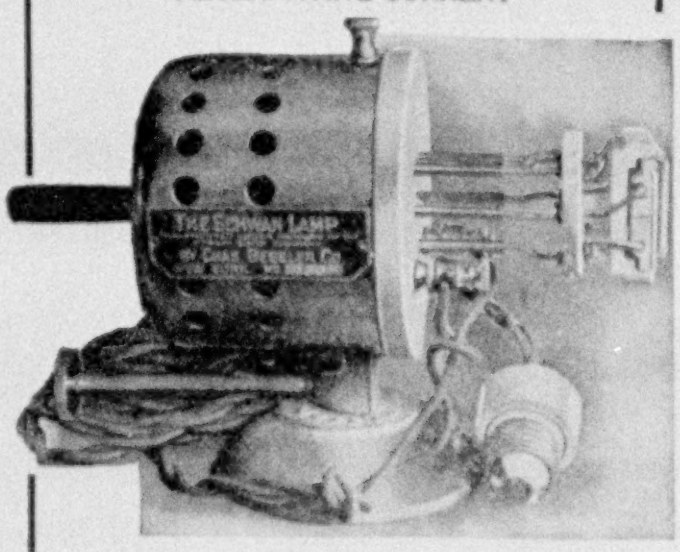

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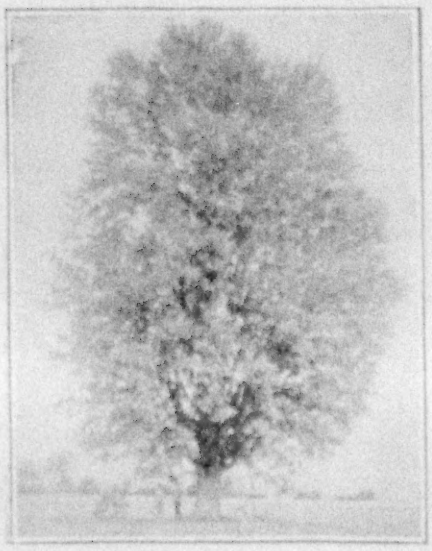

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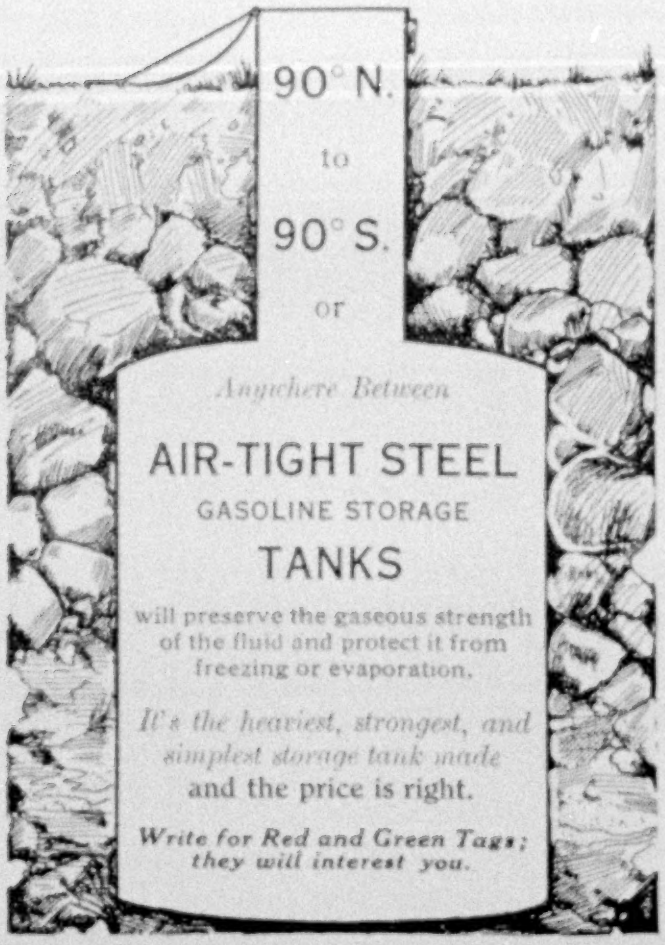

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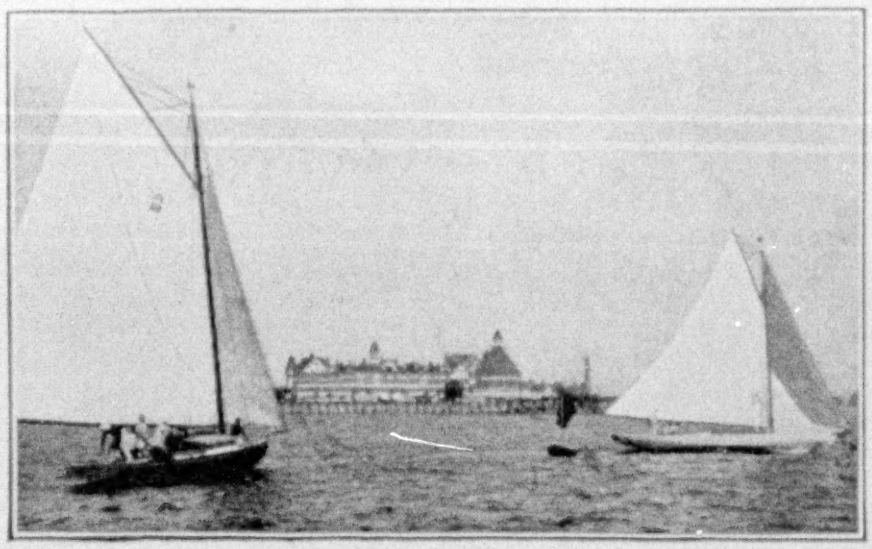

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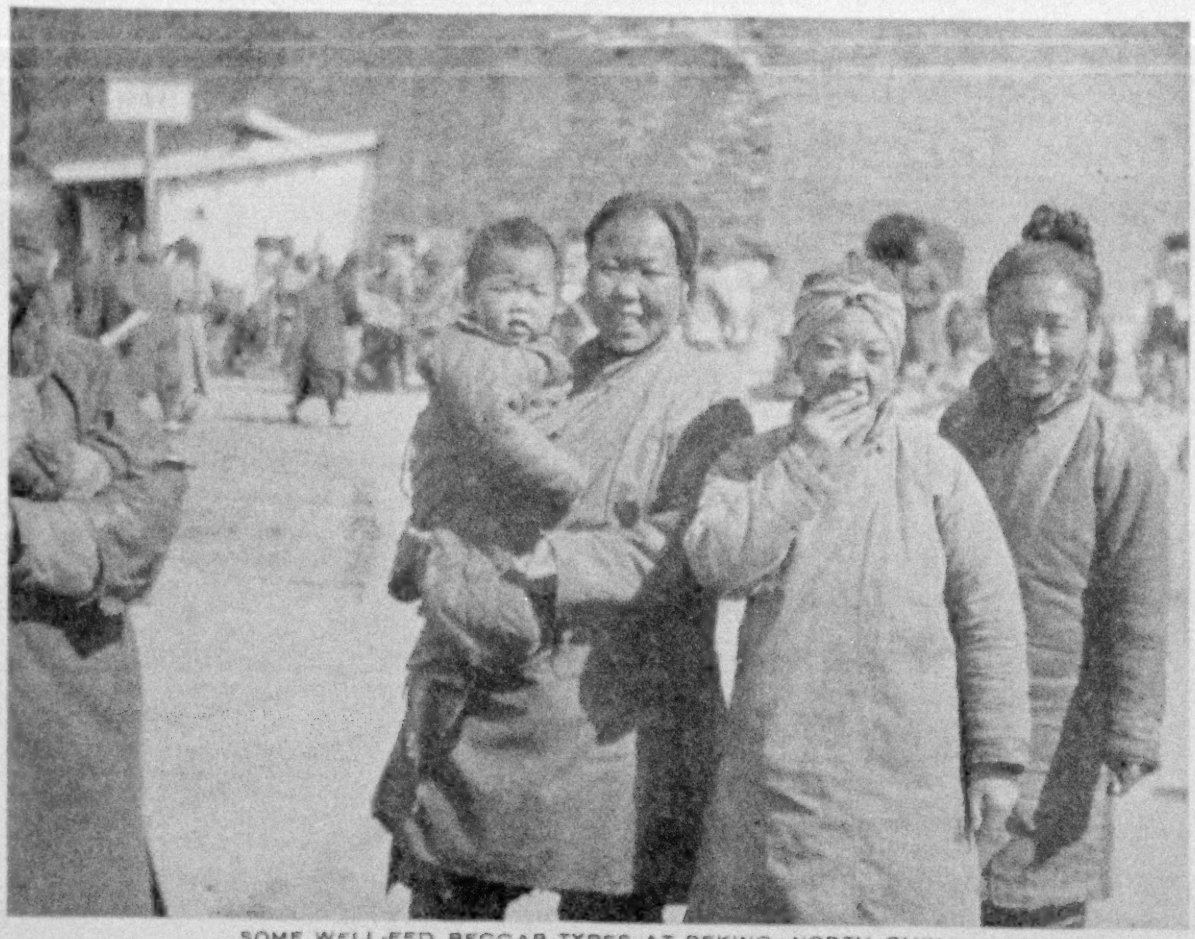

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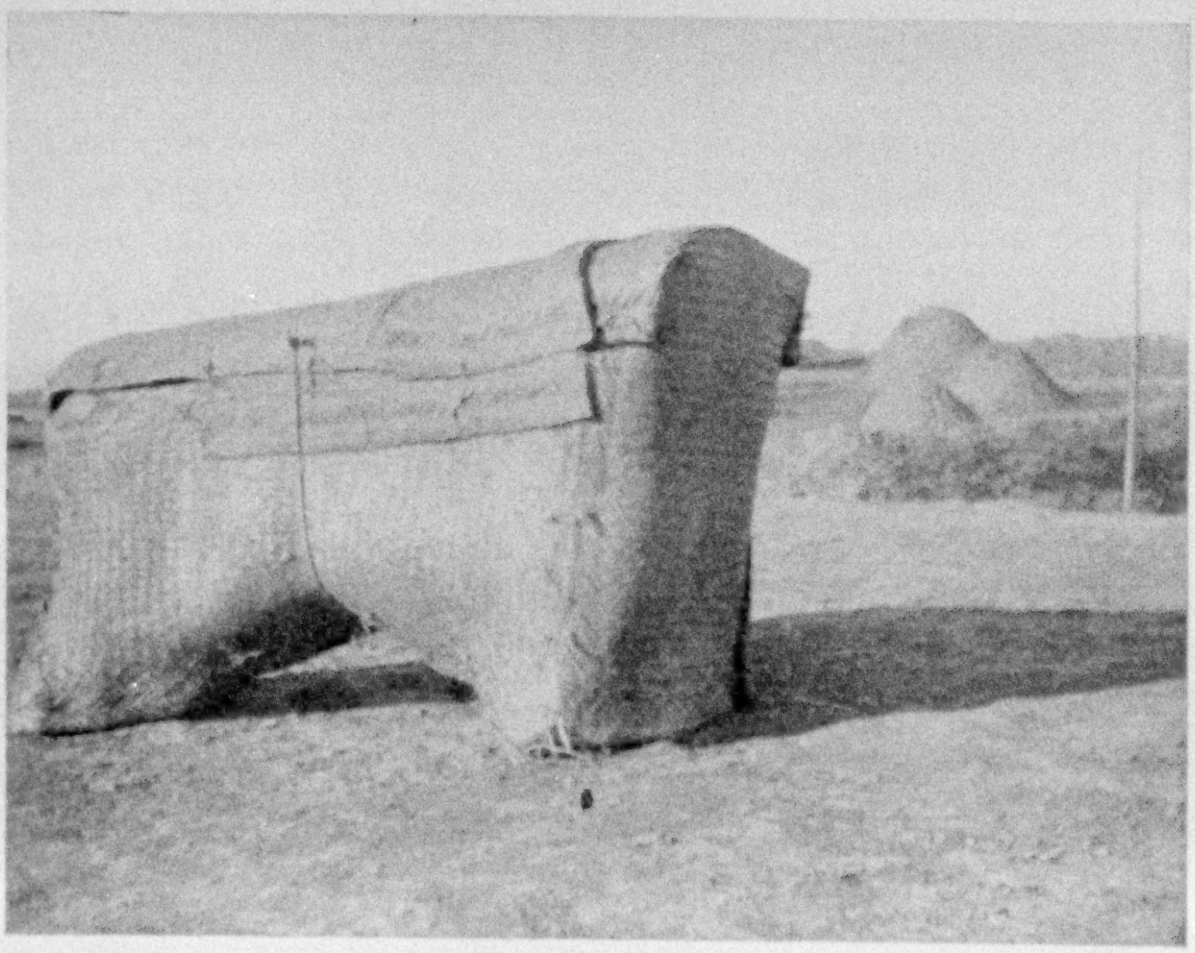

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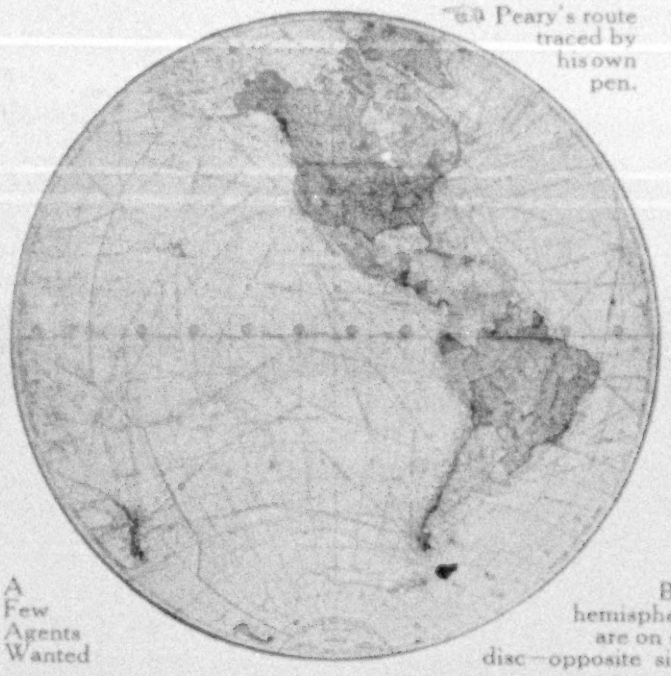

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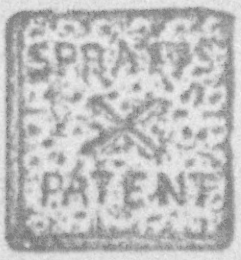

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CAPITAL - - -	$1,000,000.00
SURPLUS AND PROFITS, OVER -	$850,000.00

CHARTERED BY CONGRESS OF U. S. AND UNDER THE SUPERVISION OF THE COMPTROLLER OF THE CURRENCY

SOLICITS OUT OF TOWN ACCOUNTS AND PAYS INTEREST ON ALL DEPOSITS

ACTS AS EXECUTOR AND TRUSTEE UNDER WILL AND IN ALL FIDUCIARY CAPACITIES

BUYS AND SELLS FOREIGN EXCHANGE

JOHN JOY EDSON,
PRESIDENT

Old York Investment Company

CAPITAL, $1,000,000.00

Surplus and Undivided Profits	$267,392.49
Dividends Paid April 17, 1909	50,010.00
Dividends Paid July 7, 1909	15,003.00
Dividends Paid October 7, 1909	15,003.00

Officers and Directors

J. PHILLIP KANOKY, President
BEN BLANCHARD, Vice-Pres. & Gen. Mgr.
H. C. ARNOLD, 2d Vice-President
R. H. BURMISTER, 3d Vice-President
H. R. WOOD, Secretary
M. B. HAZELTINE, Treasurer
ED. T. OREAR, Assistant Treasurer
F. G. DODSON, Auditor

D. S. McGONIGLE
E. T. ALEXANDER
A. W. BORK
JOHN T. HARDING
RAY HILL
A. J. HEAD
JOSEPH KNOCHE
O. A. HESLA
L. E. CORBIN

Government, Municipal, and Industrial Bonds

COMMERCE BUILDING KANSAS CITY, MO.

PRESS OF JUDD & DETWEILER, INC., WASHINGTON, D. C.